MOVIDYN®
Servo Controllers

Operating Instructions

Edition 05/99

16/042/95

0922 3711 / 0599

TÜV CERT DIN EN ISO 9001

SEW EURODRIVE

Always follow the warning and safety notes contained in this manual! Safety notes are:

Electrical hazard, e.g. when working on live equipment.

Mechanical hazard, e.g. when working on hoists.

Important instructions for safe and fault-free operation.

A **requirement for fault-free operation** and fulfillment of any rights to claim under guarantee is that these **instructions and remarks** are followed. **Therefore read these instructions carefully** before you start working with the unit!

These **operating instructions** contain **important information for servicing. They should therefore be kept in the vicinity of the unit.**

Application Restrictions

The MOVIDYN® units are servo controllers for industrial and commercial drive systems for operation of three-phase AC squirrel-cage asynchronous motors or permanent-magnet three-phase AC servo motors. Other loads must not be operated with the inverters.

MOVIDYN® servo controllers are designed for stationary installation in switch cabinets. All specifications concerning technical data and permissible conditions at the equipment location must be observed.

Where applicable, commissioning (starting normal operation) is prohibited, unless the machine complies with the EMC guideline 89/336/EWG and the conformity of the finished product with the machine guideline 89/392/EWG is verified (observe EN 60204).

Unless otherwise specifically indicated, the following is prohibited:

- Implementation in areas subject to explosion hazards
- Implementation in the vicinity of oils, acids, gas, fumes, dusts, radiation, etc.
- Implementation in non-stationary applications where mechanical vibration and impact loads occur which exceed the limits stipulated by EN50178.
- Implementation in applications where the inverter alone (without a higher-level safety system) is responsible for safety tasks which must guarantee the safety of persons and machinery.

Disposal (please observe the applicable waste disposal regulations):

Depending on the material they are made of, unit components are to be disposed of in accordance with the applicable waste disposal regulations for:
electronics waste (pcbs), plastic material (housing), sheet metal, copper, etc.

1 Unit design

1.1 MPR / MPB

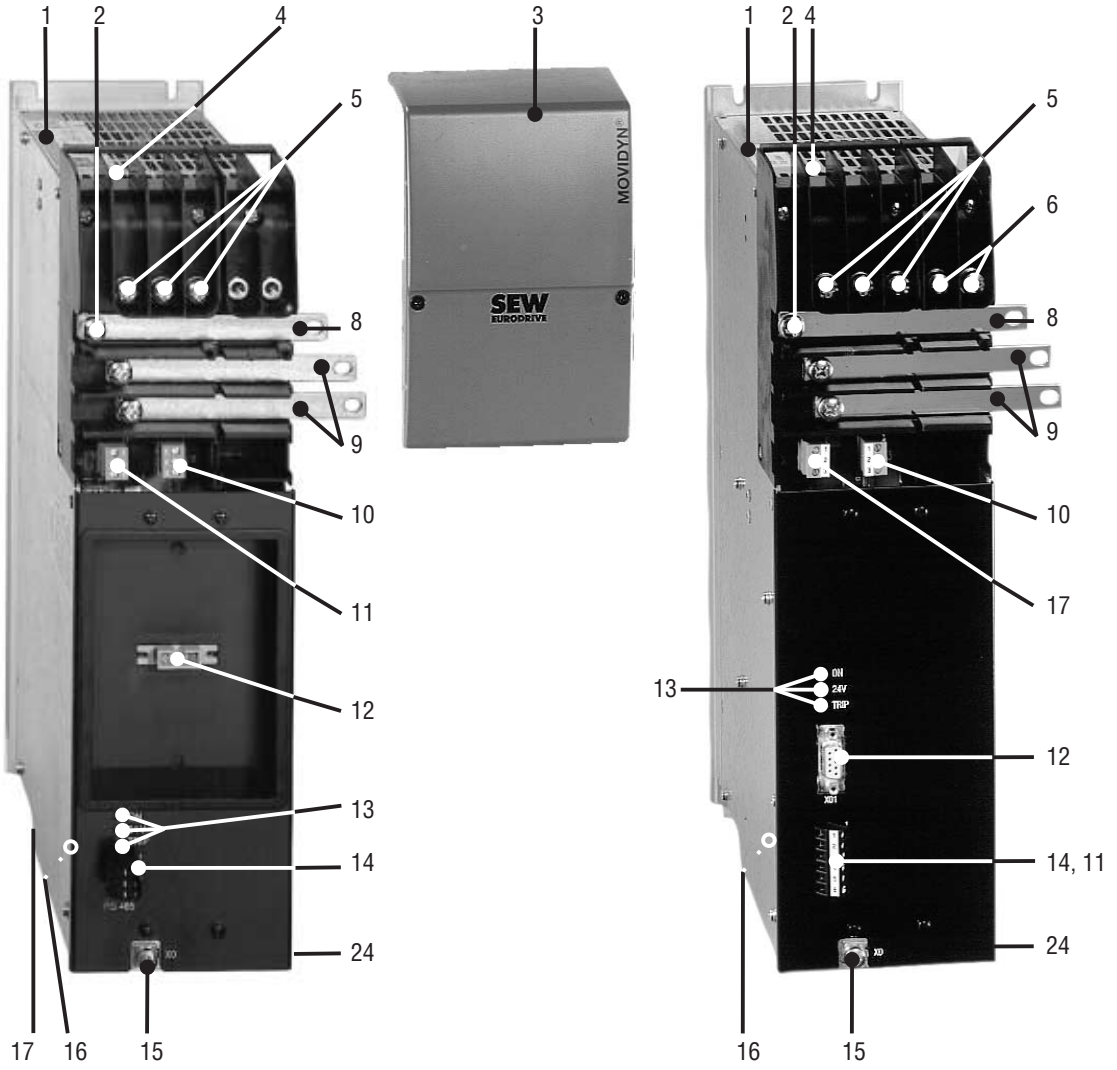


Fig. 1: Locations of the principal components of the MPR/MPB power supply module 00249CXX

1 Nameplate
2 PE terminal (X1)
3 Protective cover
4 Protective cover
5 Power supply input (1; MPx: 1, 2, 3; MKS: L1, L2, L3)
6 Braking resistor connection (MPB: X4; MKS: X1; +, R)
7 DFY motor connection (X1; MAS: 1, 2, 3); MKS: U, V, W)
8 PE connection
9 DC link connection (X1)
10 24V bus (MPx: X2 (output); MAS: X2 (input), X3 (output)
11 External 24V supply (MPR: X2; MPB: X02 (5, 6);MKS: X41 (5, 6)
12 MKS: X2/MPR: X01: for ABG11 or USS11A connection; MPB: X01: RS-232 serial interface
13 Status indicators (LEDs)

1.2 MAS/ MKS

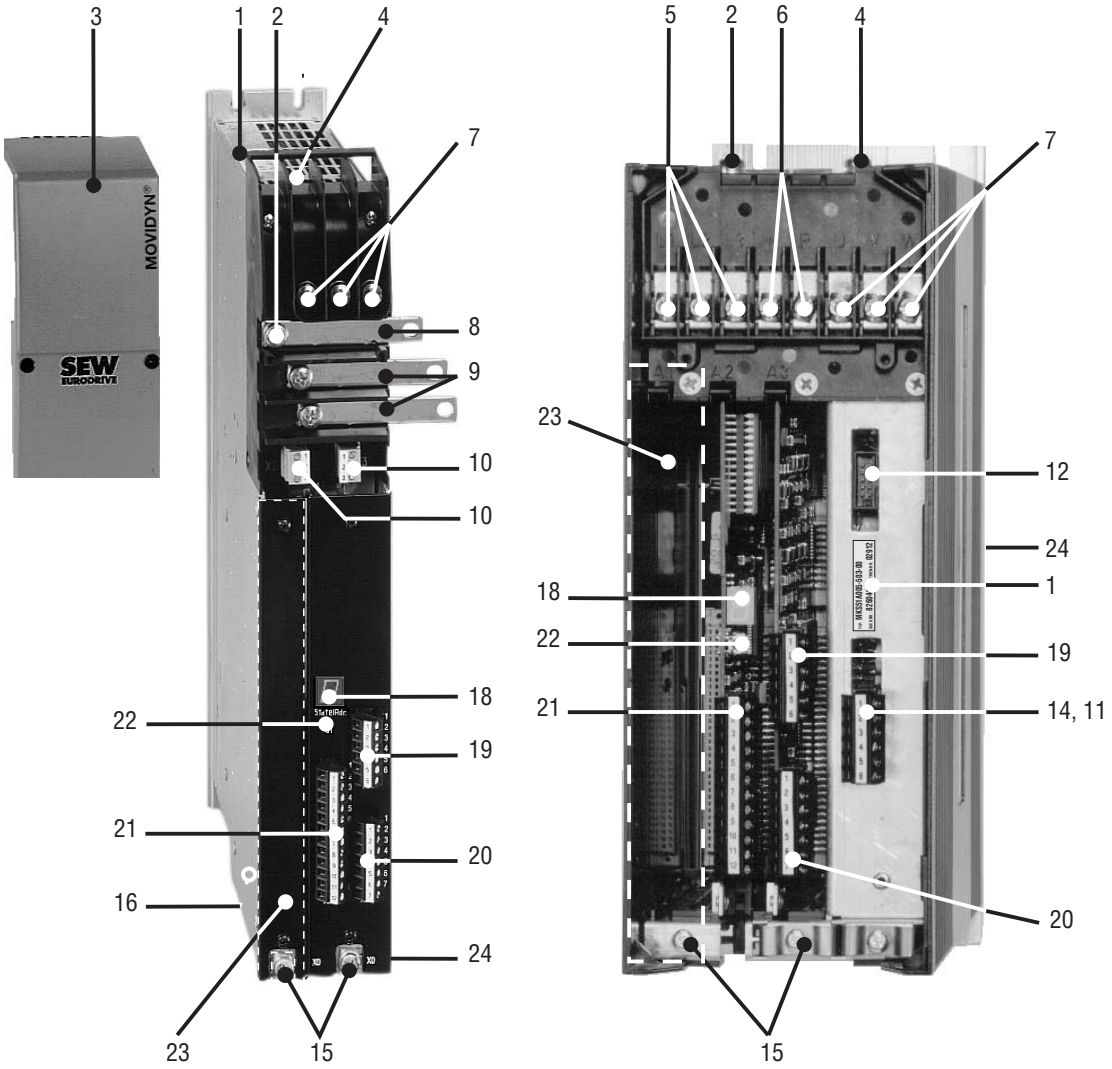


Fig. 2: Locations of the principal components of the MAS axis module / MKS compact servo controller 00250BXX

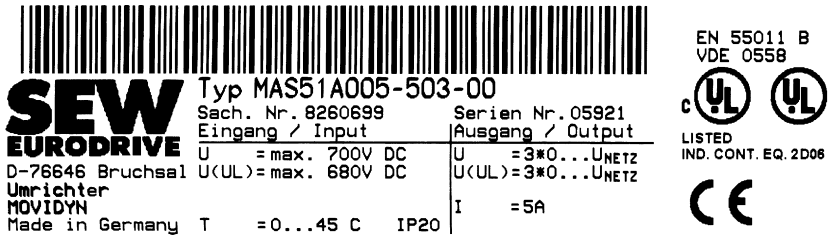
14 RS-485 serial interface (MPR: X02; MPB X02 (1, 2, 3); MKS: X41 (1, 2, 3)
15 Shield ground (electronic terminals) (X0)
16 Data bus connector (on the underside of the unit) (X5)
17 Connection for heat sink fan (MPR: X6, MPB: X2)
18 7-segment display
19 Resolver connection (X31)
20 Encoder simulation output (X32)
21 X21: Output 10V (1, 4), analog differential input (2, 3), binary inputs (5 ... 8), binary outputs (9, 10), output 24V (11, 12)
22 S1 pushbutton
23 Slot option pcb
24 Slot option pcb

MKS: Shown without protective cover

2 Controller Designation

Nameplate

Example:



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CE mark

MOVIDYN® servo controllers conform to Low Voltage Directive 73/23/EEC and to EMC Directive 89/336/EEC.

Type designation

Example:

MOVIDYN MAS51A005-503-00

Version	00 = Standard
Type of supply	3 = 3-phase
Rated supply voltage	50 = 500 V_{AC} (380 ... 500 V_{AC})
MAS/MKS: Rated current MPR/MPB: Rated power	005 = 5 A_{AC} 011 = 11 kW
Configuration status A	
Type series 51	
Type MAS (MPB/MPR/MKS)	

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3 Safety instructions

- **Installation, commissioning and servicing work** on the unit may only be performed by experienced **electricians** with the relevant training in accident prevention, in compliance with the applicable regulations (e.g. EN 60204, VBG 4, DIN VDE 0100/0113/0160).
- When **installing** and **commissioning** the motor and brake, **the applicable instructions must be observed.**
- Before removing the protective cover, the servo controller must be disconnected from the supply. **Dangerous voltages** may be present for up to **10 minutes after the unit has been disconnected from the supply.**
- When the **protective cover is removed**, the unit has enclosure **IP 00**. **Dangerous voltages** are present on all subassemblies except the control electronics. During operation, the unit must be kept closed.
- When the **unit is powered up**, **dangerous voltages** are present on the **output terminals** and the **cables and motor terminals** connected to them. This is also the case if the controller is not enabled and the motor is not running.
- When the **operating LED** or any of the other status indicators go out, this **does not mean** that the controller is disconnected from the supply and **de-energized**.
- **Protective measures** and **devices** must be chosen according to the applicable regulations (e.g. DIN VDE 0100 Part 410 / DIN VDE 0112 Part 1 or EN 60204 / DIN VDE 0160).
  Necessary protective measure:controller must be grounded
  Necessary protective devices:overcurrent protection (fuses)
- By taking proper measures (e.g. removing the electronics terminal block), **ensure** that the **motor** connected **does not start by itself when the controller is powered up**.
- Internal safety functions in the controller or mechanical blocking can result in the **motor not running**. Remedying the cause of the fault or resetting the controller can cause the **drive to restart automatically**. If this is **not permissible** for the machine being driven for safety reasons, the servo controller must **be disconnected from the supply** before remedying the fault. Furthermore the **"Auto reset"** function **(P630) must not be activated** in these cases.

4 Mechanical Installation

4.1 Assembling an axis system

- As MKS... compact servo controllers have their own integral heat sink, heat sink assembly is not required. MKS... compact servo controllers are mounted directly into the switch cabinet. However, specified minimum clearances must be observed for them, too.
- Mount the heat sinks in the switch cabinet.

- **Important:** Observe the minimum free space necessary for adequate cooling:
  above and below the unit: at least 100 mm (3.94 in)
- Clean the surfaces of the heat sinks and the rear faces of the mains and axis modules.
- Bolt the mains and axis modules onto the heat sink. The heat sinks are equipped with threaded holes for this purpose, in a 35 mm (1.38 in) grid pitch.The assembly can be carried out without heat-conducting paste.

  Tightening torque: maximum 3.5 Nm

Important: Every module must be mounted completely on one heat sink, i.e. a module may not be mounted across the butt joint between two heat sinks.

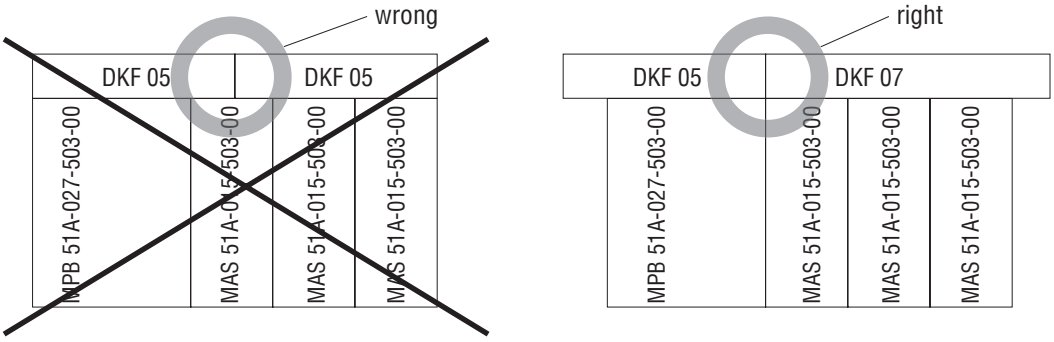

Fig. 3: Mounting of the heat sinks MD0018AEN

When using multiple heat sinks in a multi-rack block it is necessary to have a conductive connection between units (surface area ≥ 10 mm^2 (0.155 in^2)). If this is prohibited by a painted mounting plate, then a jumper (surface area ≥ 10 mm^2 (AWG#8)) must be used to connect between the mounting srews of the MOVIDYN® module and the heat sink of the next.

- We strongly recommend mounting the MPR... and MPB... power supply modules to the left of the axis modules, otherwise you may find the 24 V_{DC} bus connection difficult to install.

4.2 Line chokes

(not required for MKS... compact servo controllers)

Mount the line chokes close to the corresponding power supply module, but outside the minimum free space required for adequate cooling (→ Sec. 4.1).

5 Electrical Installation

All safety instructions (Sec. 3) must be strictly observed during the electrical installation.

The sections below describe the electrical installation for MOVIDYN® servo controllers.
To ensure interference-free operation of the unit at any time, it is recommended to install the unit in accordance with Sec. 5.9.

5.1 Assembly Instructions for Shield Terminals

Shield terminals provide a simple means of connecting motor, braking resistor and signal cable shields. Particularly where EMC-compliant wiring is required, installation is made easier with these terminals. In addition, the shields are connected over a large area for maximum effectiveness.

Fitting the terminals

1. Do not fit the cable for the motor or the braking resistor with the terminal screwed on. Bits of the shield braid may fall into the unit.

2. If you use prefabricated cable from SEW, strip off the shield for approx. 30 mm so that the cable has the correct length for connection.

3. Screw the shield terminal onto the unit, using the M4x10 and M5x10 screws supplied. Do not use screws which are longer.
4. Now connect the cable. This will avoid any unnecessary strain on the shield and prevent bits of the shield coming off.

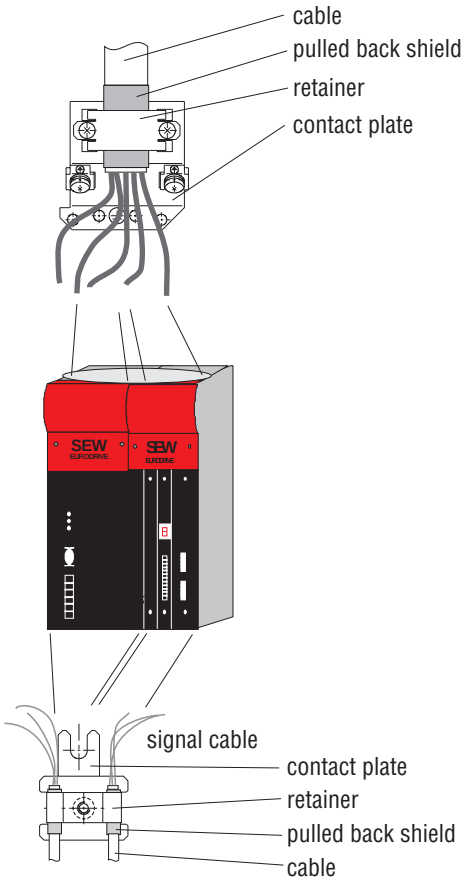

Fig. 4: Shield terminals MPB / MPR / MAS

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Shield terminals MKS

On compact servo controllers shield terminals for the signal leads are integrated into the bottom of the unit.

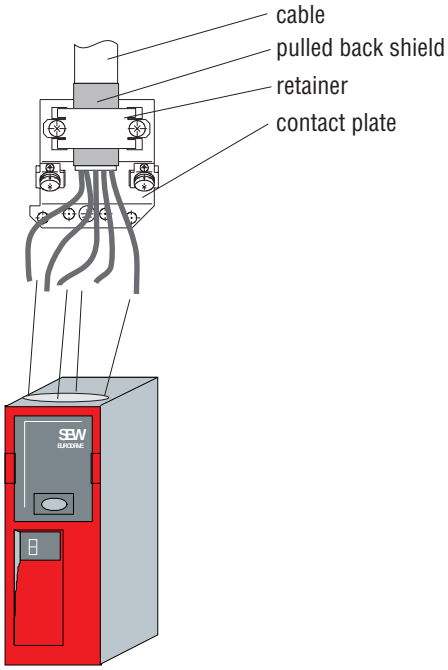

Fig. 5: Shield terminals MKS

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5.2 Connection of power supply module, axis module, braking resistor, heat sink

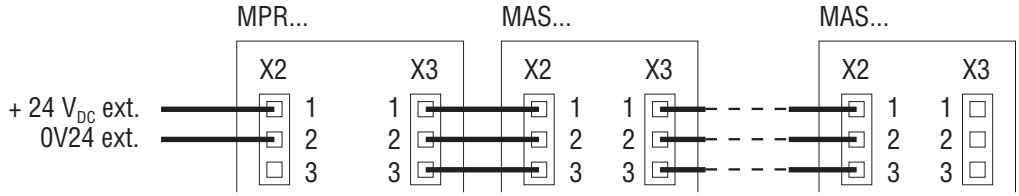
- **Connection of power supply module and axis module**
  Connect the power supply module and the axis module(s) with the busbars supplied.
  – All connections, including the protective earth (PE), must be well tightened.
  Tightening torque: 3.5 Nm
- Use the cables provided to join the connector X3 (power supply for the electronics) of each module to the X2 connector of the following module.
  Cross-section: 3 x 1.5 mm^2 (AWG#16)

- Connect the modules underneath by plugging the data-bus cable DBK into the X5 connectors.
  Important: unused connectors should not be cut off, but folded back and tied up.
- **Braking resistor connection:**
  Connect the braking resistor to terminals X4.+ and X4.R of the MPB... power supply module or to terminals X1.+ and X1.R of the compact servo controller.
  Use two leads close together (e.g. twisted pair).
  The lead cross-section must be rated for maximum braking current. Data: → Sec. 9.4

  Important: When operated under rated conditions the leads to the braking resistor carry high DC voltages (up to approx. 900 V_{DC}. Shielding of the leads is recommended)!
- **Operation with DKF heat sinks:**
  Connect the fan to terminals X2.2 and X2.3 of the MPB... power supply module or terminals X6.1 and X6.2 of the MPR... power supply module respectively.
  Important: Make sure the polarity is correct: X2.2 / X.6.2: black cable / X2.3 / X6.1: red cable

- **MPR… 24 V supply** (possibilities for connection: see Sec. 9.1, switch-mode power supply)

With the external 24 V_{DC} supply (+ 24 V_{DC} … + 30 V_{DC})



Without the external 24 V_{DC} supply

(permissible with 2 axis modules without option cards or 1 axis module with option card)

Not with MPB… !

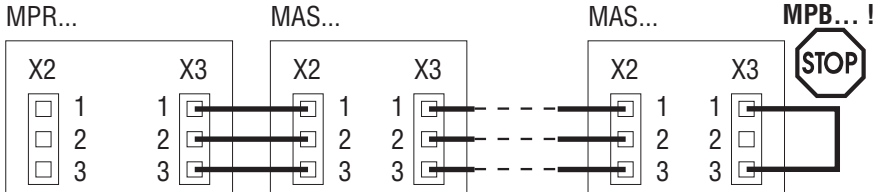


Fig. 6: 24 V supply MPR... MD0164CEN

We recommend the use of an external 24 V_{DC} power supply for the MPR module, as the 24 V_{DC} switch cabinet power supply is not adequate for large systems!

5.3 Mains supply leads, input fuses

- Label the power supply leads as L1, L2, L3 in accordance with IEC 445.
- All connections – including the protective earth – must be well tightened. Maximum tightening torque: 3.5 Nm
- Install the mains input fuses F1, F2, F3 directly after the busbar junction of the mains leads.
- Always install the mains contactor in front of the mains filter if one is installed (→ page 15).

5.4 Motor leads

- Lead length: 100 m (325 ft) max. (DFY 56 M motors: 40 m (130 ft) max.)
- Label the motor leads as U, V, W in accordance with IEC 445.
- All connections – including the protective earth – must be well tightened. Maximum tightening torque: 3.5 Nm.
- **Important:** Observe the phase sequence! (→Sec. 5.11)!
- Segregate the motor leads from all other leads. If a minimum spacing of 20 cm (8 in) over longer runs (20 m (65 ft)) is not possible, then it is suggested to shield the motor leads. If shielding is not possible, please contact us for assistance.
- Output filters between the servo controller and the motor are not permissible.

5.5 Resolver cable

- Use a shielded cable with leads twisted in pairs (1/2, 3/4, 5/6) (→ Wiring diagram Sec. 5.11).

  Length: max. 100 m (325 ft) 8-core: 3 x 2 for the resolver, 1 x 2 for the motor protection
  Cross-section: I ≤ 50 m (164 ft): 0.25 mm^2 (AWG#24); I > 50 m (164 ft): 0.50 mm^2 (AWG#20)
- Shielding earthed over a large contact area. For this purpose, connect the complete cross-section of the shielding braid directly to ground (terminal X0) , i.e without any extension.

5.6 Protection of motor and equipment

- Protect the motor by connecting a TH embedded thermostatist or a PC thermistator as per the wiring diagram (→ Sec. 5.11). A motor circuit-breaker is not sufficient.
- Protect the braking resistor from excessive duration of current (does not apply to MPR... power supply modules) by using an overcurrent circuit breaker with a thermal trip (F16).
  The thermal overcurrent circuit breaker must operate directly on the mains contactor K11.

5.7 Mechanical brake control

(only for operation with type DFY ... B motors)

Important: Observe the operating instructions for DFY motors and the following block diagram!

Observe the following notes to ensure trouble-free operation of the mechanical brake:

- Actuate the brake via binary output X21.9 “Brake”, not via a PLC (brake actuation by a PLC may result in uncontrolled system conditions).
- The binary output X21.9 is not suitable for actuating the brake directly!
- It is implemented as a relay driver with an actuating voltage of 24 V / 3.6 W / max. 150 mA.
  It is recommended that it is connected to the following (take account of the switching capacity of the relay or miniature contactor):
  - an external brake relay K 13 which is suitable for switching an auxiliary contactor K12 (e.g. contact rating 250 V_{AC} / 0.25 A_{AC} / AC 11 or 24 V / 0.6 A_{DC} / DC 11 as per IEC 337-1). The contact of brake relay K 13 is wired in series with the other interlocking contacts in the installation which control the auxiliary contactor K 12 for brake actuation. Relays with integral rectifiers can also be used. The brake relay must not be used for direct switching of the power to the brake coil without using an auxiliary contactor!
  - or a miniature contactor = auxiliary contactor K 12 (24 V / 3.6 W / 150 mA) for direct brake actuation.
- When using the **BME brake rectifier**:
  Connect the BME brake rectifier to its own supply lead, do not feed it from the motor supply voltage! Segregate the connecting lead from the brake to the BME from the motor lead and screen if possible.
- When using the **BSG brake controller** (24 V_{DC} supply voltage): the supply voltage for the terminals X21.. of the axis module and the BSG must be led out separately!
- Brake application can be achieved by switching off the brake rectifier either in the AC circuit (reaction time t_{2I}) or in the AC and DC circuits (reaction time t_{2II}).

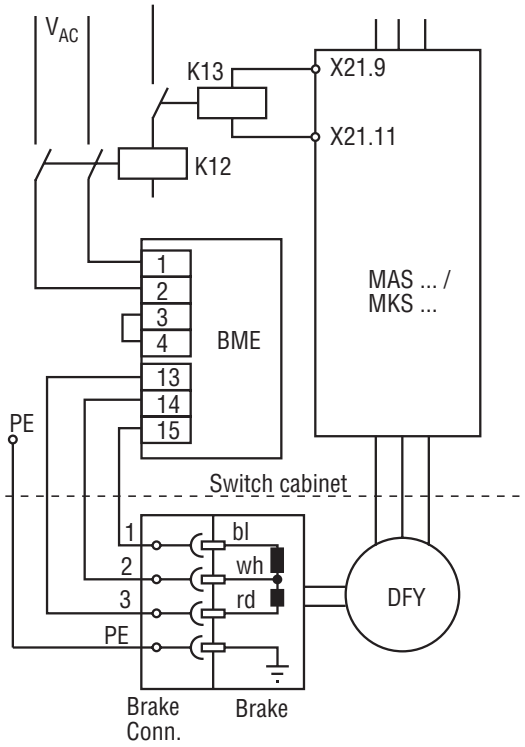
For hoists, only use the switch-off in AC and DC circuits!

Brake reaction times															
Brake motor size		**DFY 56 B**	**DFY 71 B2**				**DFY 90 B4**					**DFY 112 B10**			
Braking torque	[Nm]	2.5	3	6	10	15	6	12	20	30	40	17.5	35	60	90
Brake release **reaction time t_1**	[ms]	7	10	12	16	20	11	13	15	18	22	11	14	22	35
Brake reaction times **reaction time t_{2I}** **reaction time t_{2II}**	[ms]	5	 400 95	 220 45	 120 20	 65 8	 200 40	 140 28	 90 20	 55 13	 42 10	 440 130	 315 60	 230 32	 170 20

Block diagram: Brake motor DY..B with brake rectifier BME[1)]

via brake relay K 13 and auxiliary contactor K 12

switch-off on AC side of circuit



switch-off on AC and DC side

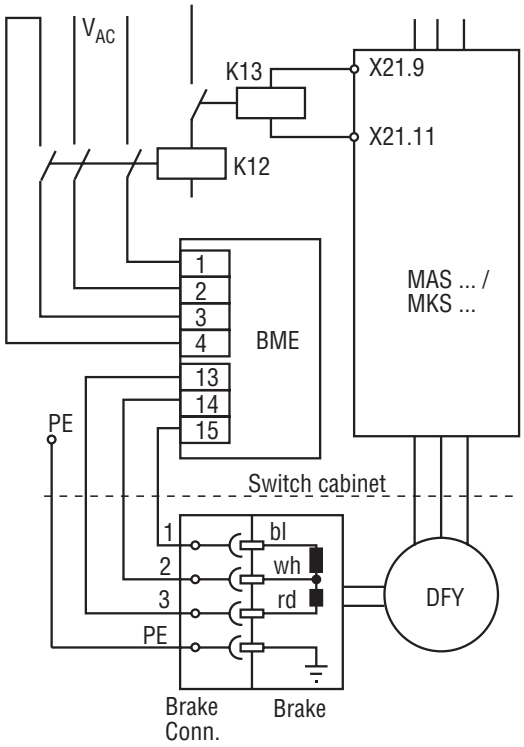


Fig. 7: Brake actuation

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1) In DY 56 ..B brake motors, the brake is controlled directly with 24 V (without brake rectifier).

5.8 Electronics leads and signal generation

- The electronics terminals are suitable for wire cross-sections up to 1.5 mm^2 (AWG#16).
- Unshielded leads can only be used if the signal and return leads are twisted pairs for the go and return leads. They must be laid separately from power-carrying leads and control leads to contactors or leads to braking resistors.
- **0V leads must not be switched** for signal generation.
- **0V leads** within a system are connected via the data bus (0V5) and the 24V bus (0V24). In the case of the MKS... compact Servo controller the 0V leads are connected within the unit.
- **0V leads** of several connected axis systems are not to be linked from unit to unit, but wired in a **star configuration.**
- Binary input commands can be given directly as a "0" → "1" command from the higher-level control. For this purpose the reference potential of the binary input X21/11 must be connected to the reference ground (0V) of the higher-level control. Signal levels → Sec. 4.10.
- If interposing relays are to be used, they must be relays with encapsulated, **dust-tight electronic contacts.** The interposing relays must be able to switch low currents and voltages (5 - 20 V; 0.1 - 20 mA).
- **Do not remove or plug in the connectors for the RS-485 interfaces, X02 for MPB/MPR and X41 for MKS, unless the controller has been disconnected from the voltage supply.**

5.9 EMC-compliant installation

When installed in accordance with the instructions given for EMC-compliant installation, MOVIDYN® servo controllers meet the requirements for compliance with EMC Directive 89/336/EEC.

Interference immunity:

MOVIDYN® servo controllers comply with all the immunity requirements of EN 50082-2.

Interference emission:

Higher levels of interference are permitted for industrial environments. In an industrial environment one or several of the below listed measures may be done without, depending on supply system specifications and the specifics of the installation.

To meet emission limits for the residential, commercial and light industrial environment (class B limit to EN 55011) we recommend the following measures:

- For all MOVIDYN® units: Connect an appropriate NF...-... line input filter on the input side. On the output side, use an HD00X output choke or a shielded motor cable.
- Mount the NF ...-... line input filter close to the corresponding MOVIDYN®, but outside the minimum ventilation space required.
- Keep the connecting lead between the line input filter and the MOVIDYN® as short as possible, the maximum permissible lead length is 400 mm (15.75 in) . Unshielded, twisted-conductor leads are satisfactory. The power cable should be unshielded too.
- If several servo controllers are connected to one line input filter, this filter must be mounted either directly at the switch cabinet entrance or in the immediate vicinity of the controllers. The selection of the line input filter is based on the total current of all the controllers.
- Provide the line input filter and the MOVIDYN® with a ground which is effective at RF (wide-area metallic contact between housings and ground, e.g. with the unpainted switch cabinet mounting panel).
- Shield control leads and motor cables (unless an HD00X output choke is used).
- Laying the cables in separate, grounded metal ducts or conduits is also effective as a shield.

- The shield must be grounded by the most direct possible route with a wide-area contact to ground at both ends. If necessary, one shield end may be grounded via an interference suppression capacitor to prevent ground loops. Alternatively, use double-shielded cable with the outer shield grounded at the MOVIDYN® side, and the inner shield at the other end.

Correct wiring for EMC

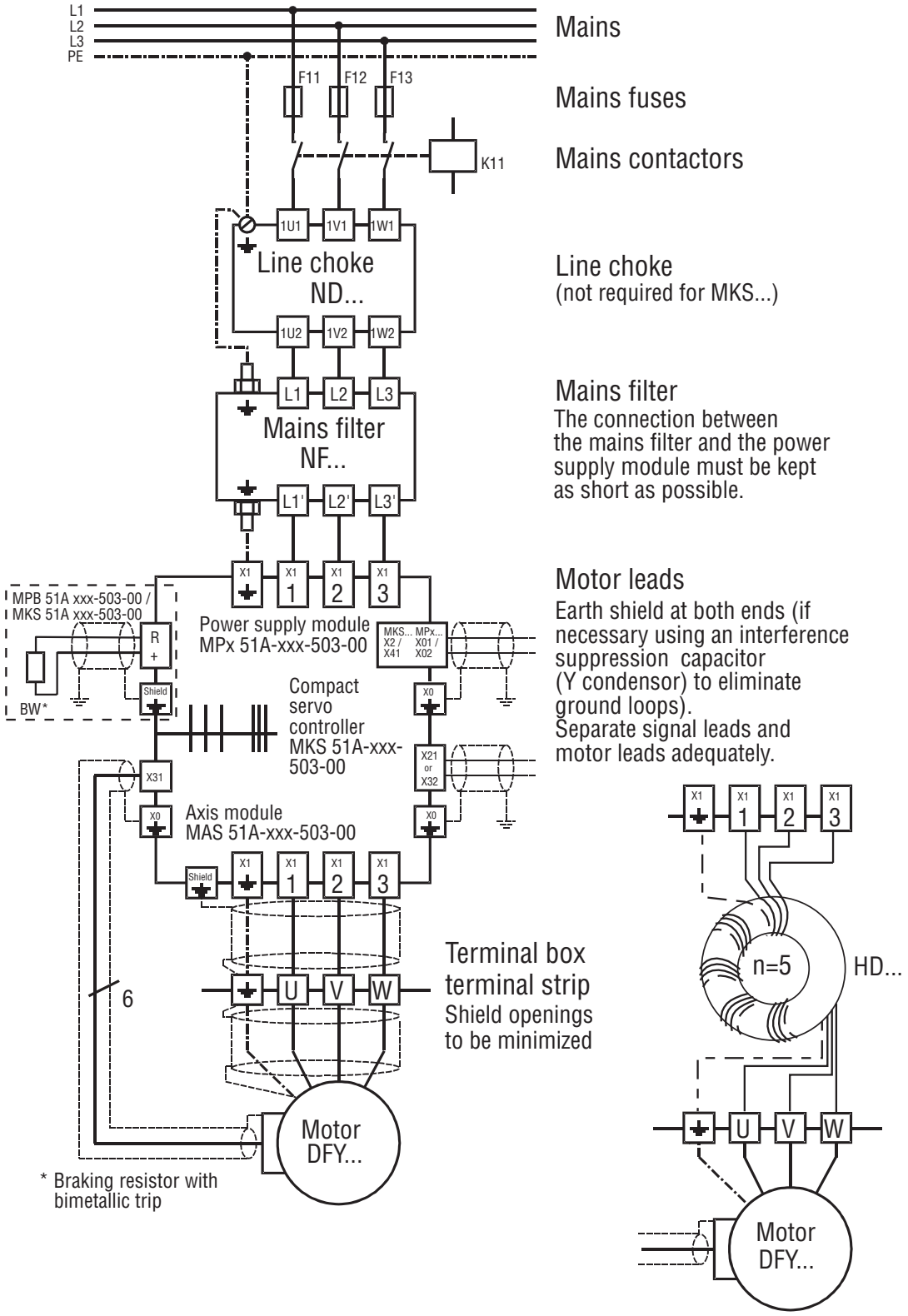

Fig. 8: Wiring for compliance with EMC requirements

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5.10 UL-compliant Installation

The following data applies only to UL-listed units. These units carry the UL-mark on the nameplate.

For UL compliant installation, please observe the following instructions:

- Only copper cables with a temperature range of 60/75°C may be used as connection leads.
- The permissible tightening torque of the MOVIDYN® power terminals is as follows:
  MPB51A, MPR51A, MAS51A → 3.5 Nm (31 in.-lbs.)
  MKS51A → 1.5 Nm (13.3 in.-lbs.)
- MOVIDYN® drive inverters are designed for operation on voltage systems which can provide a maximum current according to the table below and have a maximum voltage of 500 V_{AC}. The performance data of fuses must not exceed the values given in the following tables.

MOVIDYN®	max. current	max. mains voltage	fuses
MPB51Axxx-503-xx MPR51Axxx-503-xx MAS51Axxx-503-xx MKS51A005-503-xx MKS51A010-503-xx	5000 A	500 V	–
MKS51A015-503-xx	10000 A	500 V	30 A / 600 V

5.11 Wiring diagrams

- MPB... power supply module with brake chopper/ MAS...axis module.

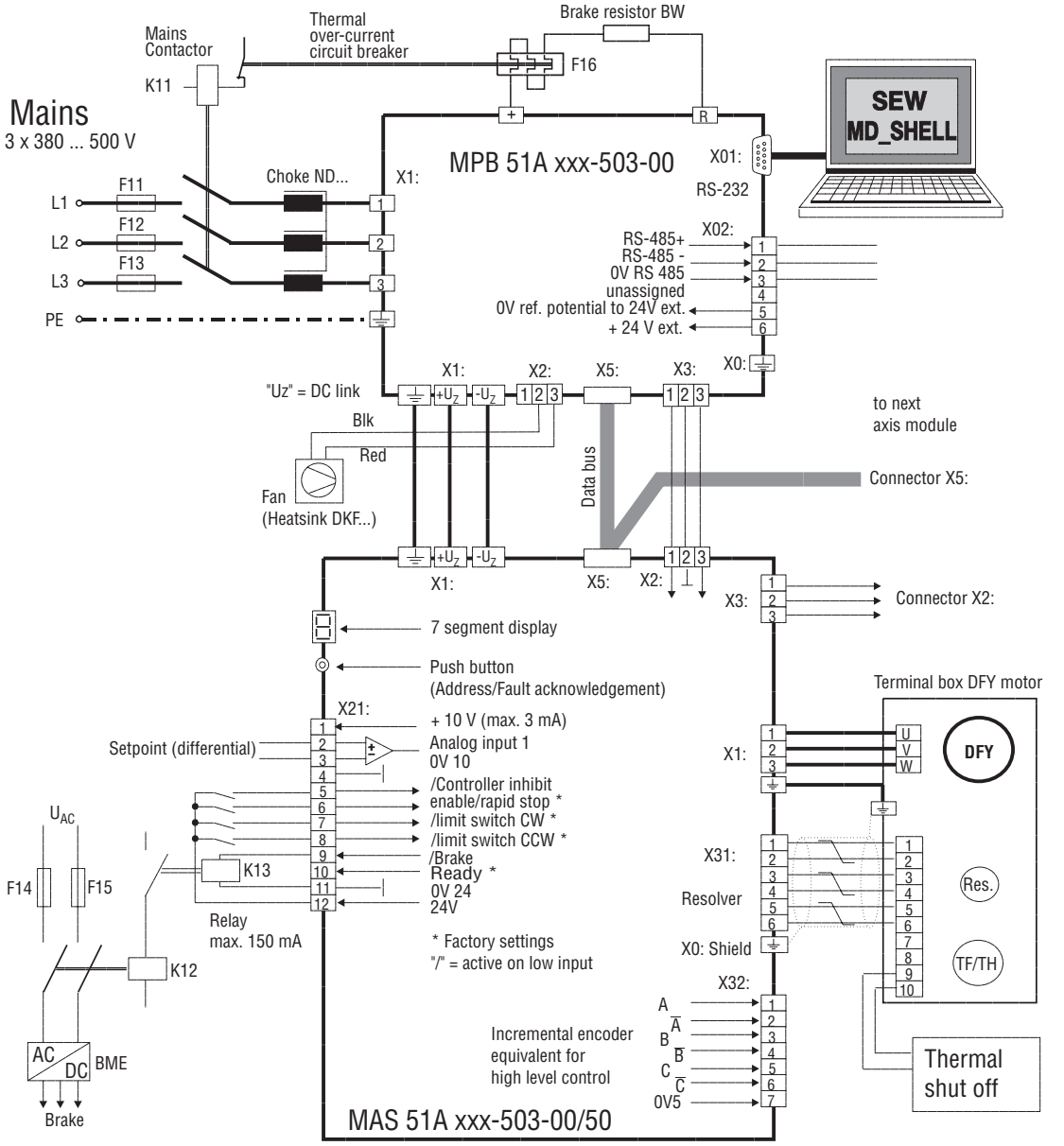


Fig. 9: MPB... / MAS.. wiring diagram MD0026EEN

- MPR...power supply module with energy feedback/ MAS... axis module

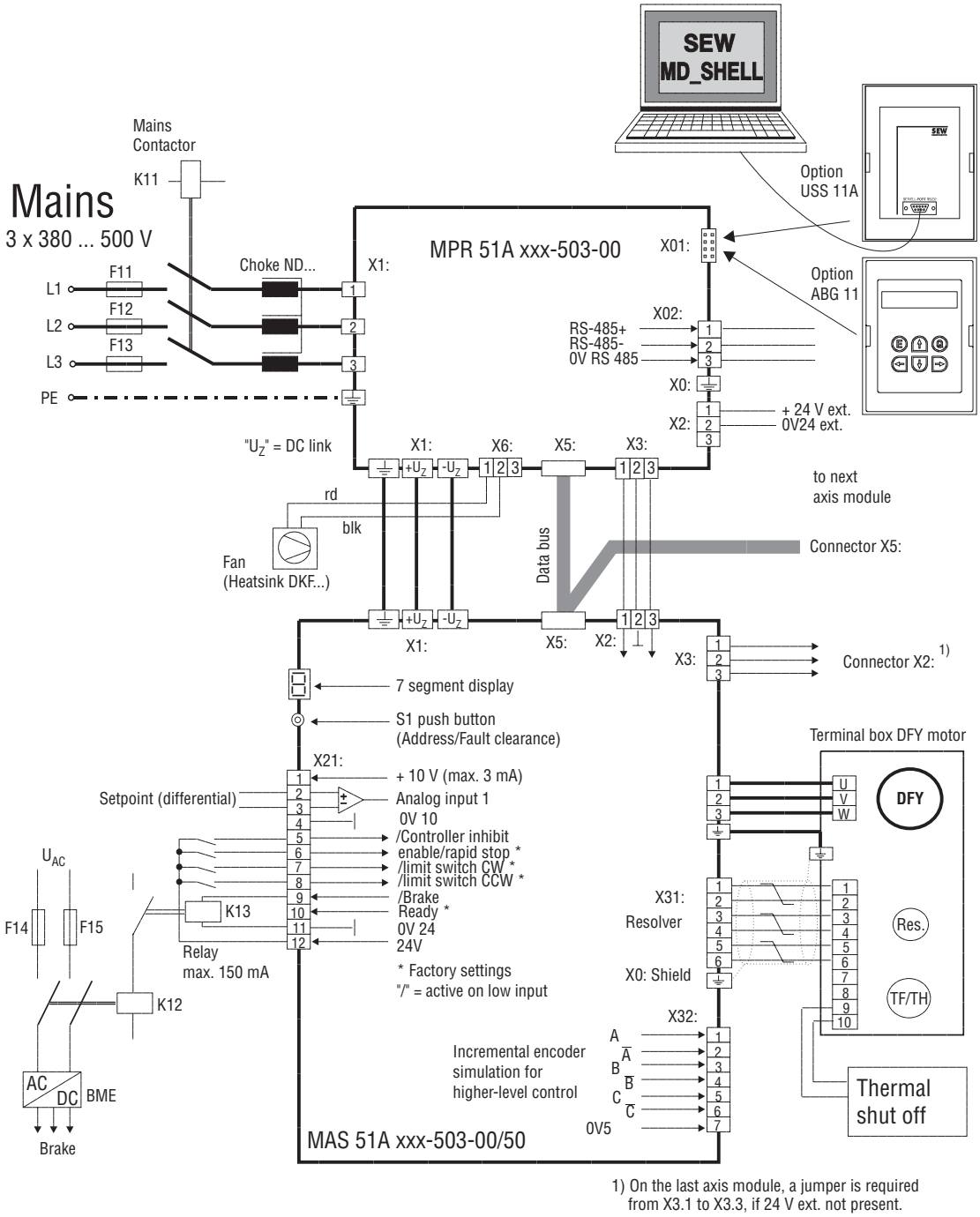


Fig. 10: MPR.../MAS wiring diagram MD0004DEN

- MKS...compact servo controller

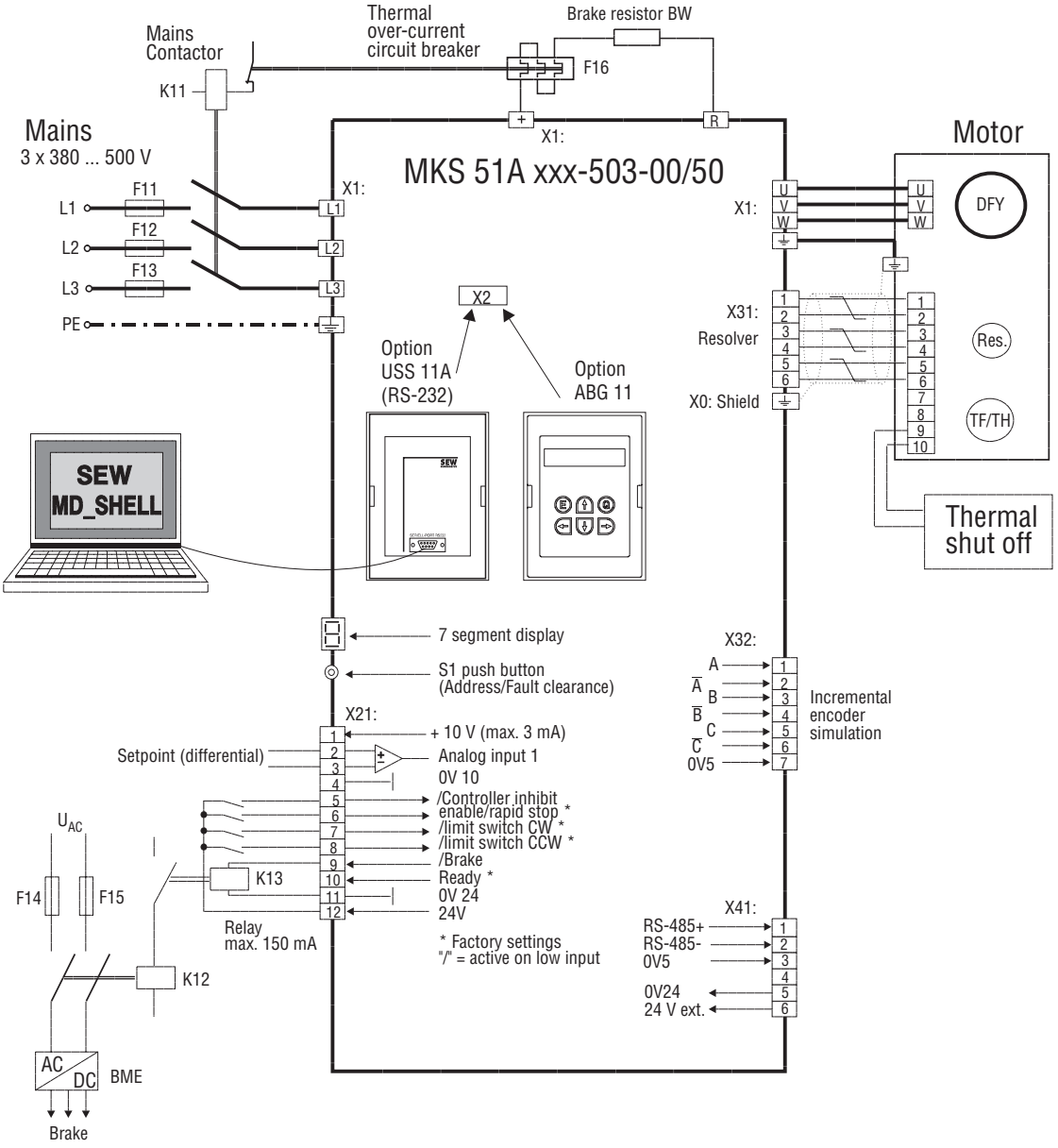


Fig. 11: MKS... wiring diagram MD0025DEN

5.12 Functional describtion of the terminals

• MPB…power supply module with brake chopper

Function	Conn.	Term.	Data	
Schield earth	X0			
RS-232 serial interface PC connection Submin. D connecter, 9-pin	X01	2 3 4 5	RXD = received data TXD = transmitted data DTR = data terminal ready: 0V5 = RS-232 reference potential	shielded cable length max. 5 m (15 ft) send/receive change-over
RS-485 serial interface alternative PC connection	X02	1, 2 3	RS-485 +, RS-485 - 0V5 = RS-485 signal ground	shielded cable max. length 200 m (650 ft)
unused		4		
Connection for external supply to maintain system functions, e.g. when mains is off		5 6	0V24 = reference of external 24 V +24 V (+18 V_{DC} ... +30 V_{DC})	power required ca. 40 W per axis module
Mains input	X1	1, 2, 3	V_{mains} = 3 × 380 V_{AC} ... 500 V_{AC} ± 10 %	
DC-link voltage, connection by busbars to axis modules		+$V_{DC\ link}$, –$V_{DC\ link}$ ⏚	$V_{DC\ link}$ = 700 V_{DC} $V_{DC\ link\ max}$ = 900 VDC PE (protective earth)	
Internal supply	X2	1	Connection PROHIBITED! Unit can be damaged if this connection is used.	
Fan connection for heat sink type DKF..		2 3	0V24 = reference potential for 24 V +24 V_{DC}, regulated	
Supply output for axis module electronics (24 V bus)	X3		cable supplied	
BW braking resistor connection	X4	+ R	Select appropriate type in accordance with the technical data	max. length 100 m (325 ft)
Data bus connector (underside of unit)	X5		data-bus cable DBK	

• MPR…power supply with energy feedback

Function	Conn.	Term.	Data	
Screen earth	X0			
Connection for diagnosis and memory module or serial interface	X01			
RS-485 serial interface connection alternative PC connection	X02	1, 2,3	RS-485 +, RS-485 - 0V5 = RS-485 reference potential	screened cable max. length 200 m (650 ft)
Mains connection	X1	1, 2, 3	V_{mains} = 3 × 380 V_{AC} ... 500 V_{AC} ± 10 %	
DC link voltages Axis module connection by busbars		+$V_{DC\ link}$ -$V_{DC\ link}$ ⏚	$V_{DC\ link}$ = 700 V_{DC} / $V_{DC\ link\ max}$ = 900 VDC PE (protective earth)	
External 24 V supply	X2	1 2 3	24 V (+ 18 V_{DC} ... + 30 V_{DC}) (see chap. 4.1) 0V24 = ext. 24 V reference potential not assigned	power consumption: approx 40 W per axis module
Output for axis moduleelectronics supply (24 V bus)	X3		Cable supplied	
Data bus connector (unit underside)	X5		DBK ... data bus cable connection	
Fan connection for heat sink type	X6	1 2	+ 24 V_{DC} 0V24	
Internal voltage		3	It is strictly prohibited to connect this terminal. The unit may be severely damaged if connected.	

- **MAS… axis module**

Function	Conn.	Term.	Data		
Shield earth	X0				
DC-link voltage connection by bus bars	X1	+$V_{DC\ link}$, –$V_{DC\ link}$ ⏚	$V_{DC\ link}$ = 700 V_{DC} PE (protective earth)		$V_{DC\ link\ max}$ = 900V_{DC}
Connection for permanent-field synchronous motor DFY		1, 2, 3 ⏚	V_{mains} = V_{AC}max. ft)PE (Schutzleiter) PE (protective earth)		length 100 m (325 ft) (DFY 56 M: max. 40 m (130 ft))
Input for electronics power supply (24V Bus)	X2	1, 2, 3	cable supplied		
10 V supply, e.g. for setpoints	X21	1 4	+10 V_{DC}, max. 3 mA 0V10 = reference potential for 10 V		
Analog differential inputs		2, 3	U_{A1} setpoint 1: -10 V_{DC} ... +10 V_{DC} R_i ≥ 20 kW		
Binary outputs fixed freely programmable freely programmable freely programmable		 5 6 7 8	 /Controller inhibit Enable/rapid stop[1)] /Limit switch CW [1)] /Limit switch CCW [1)]		as per DIN 1924 "1": +13 V_{DC} ... +30 V_{DC} typ.: +24 V (6 mA) "0": –3 V_{DC} ... +5 V_{DC}
Binary outputs fixed freely programmable		 9 10	 relay driver for brake relay ready [1)]		 "1": +24 V_{DC}; max.150 mA "1": +24 V_{DC}; max. 50 mA
24 V supply output e.g. for binary inputs		11 12	0V24 = reference potential 24 V +24 V_{DC}		max. 200 mA
Output for electronics power supply (24V-Bus)	X3	1, 2, 3	cable supplied		
Resolver connection - motor	X31	1 2 3 4 5 6	ref + (R1) ref – (R2) cos + (S1) cos – (S3) sin + (S2) sin – (S4)	resolver signals	twisted pairs, shielded cable, max. length 100 m (325 ft)
Encoder simulation output	X32	1, 2 3, 4 5, 6 7	A, $\overline{A}$ B, $\overline{B}$ C, $\overline{C}$ 0V5 = reference potential for encoder simulation		RS-422-level, 1024 pulses/rev.
Data bus connector (underside of unit)	X5		data-bus cable DBK..		

1) Factory setting

- **MKS… compact servo controller**

Function	Conn.	Term.	Data		
Power connections	X1	L1 L2 L3	V_{mains} = 3 × 380 V_{AC} ... 500 V_{AC} ± 10 %		
		+ R	Braking resistor Select appropriate type in accordance with the technical data		
Connection for DFY permanent-field synchronous motor		U V W	V_{max} = V_{mains}		max. length 100 m (325 ft) (DFY 56 M: max. 40 m (130 ft))
Connection for diagnosis and memory module or serial interface	X2				
10 V supply, e.g. for setpoints	X21	14	+10 V, max. 3 mA 0V10 = reference potential 10 V		
Analog differential input		2, 3	U_{A1} Setpoint 1: -10 V_{DC} ... +10 V_{DC} $R_i \geq 20$ kW		
Binary inputs fixed freely programmable freely programmable freely programmable		5 6 7 8	Controller inhibit Enable/rapid stop[1] /Limit switch CW[1] /Limit switch CCW[1]		as per DIN 19240 "1": +13 V_{DC} ... +30 V_{DC} typically +24 V (6 mA) "0": –3 V_{DC} ... +5 V_{DC}
Binary inputs fixed feely programmable		9 10	Relay driver for brake relay ready for operation[1]		"1": +24 V; max. 150 mA "1": +24 V; max. 50 mA
24 V supply output, e.g. for binary inputs		11 12	0V24 = reference potential for 24 V +24 V_{DC}		max. 200 mA[2]
Resolver connection-motor	X31	1 2 3 4 5 6	ref + (R1) ref – (R2) cos + (S1) cos – (S3) sin + (S2) sin – (S4)	Resolver signals	twisted pairs screened cable max. length 100 m (325 ft)
Encoder simulation output	X32	1, 2 3, 4 5, 6 7	A, $\overline{A}$ B, $\overline{B}$ C, $\overline{C}$ 0V5 = reference potential for encoder simulation		RS-422-level, 1024 pulses/rev.
RS-485 serial interface	X41	1 2 3	RS-485+ RS-485– 0 V reference potential		
Connection for external voltage supply		4 5 6	not assigned 0 V reference potential + 24 V (18 ... 30 V)		power consumption: approx. 40 W

1) Factory setting
2) MKS: If there is no external 24 V supply, the load on X21:12 (MKS) and X13:1 (APA12/API12) together must not exceed 200 mA.

5.13 RS-485 Interface Connection

Using the RS-485 interface, up to 32 MOVIDYN® units can either be interconnected, for instance for master-slave operation, or up to 31 MOVIDYN® units connected to a higher-level automation system (PLC).

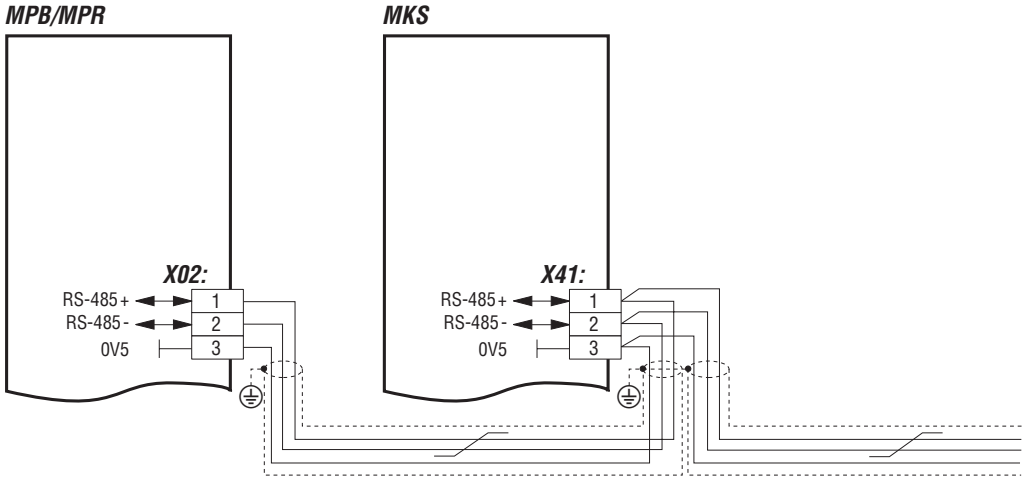


Fig. 12: RS-485 Link 02241AXX

Special note:

- Use a 4-core twisted and shielded copper cable. Twist the signal cables together and connect the shield at either end to the electronics shield clamp of MOVIDYN® over a large area, or earth it over the higher-level control system.
- Run the 0V5 reference voltage on the second cable pair. There must not be any potential displacement between the units which are connected together via the RS-485.
- The permitted total cable length is 200 m (660 ft).
- Terminating resistors are integrated. **Do not connect external terminating resistors!**
- There must not be any potential displacement between the units which are connected together via the RS-485. Take suitable measures to avoid a potential displacement, for instance by connecting the unit ground connectors using a separate lead.

6 Fitting option pcbs

Before you start

Option pcbs

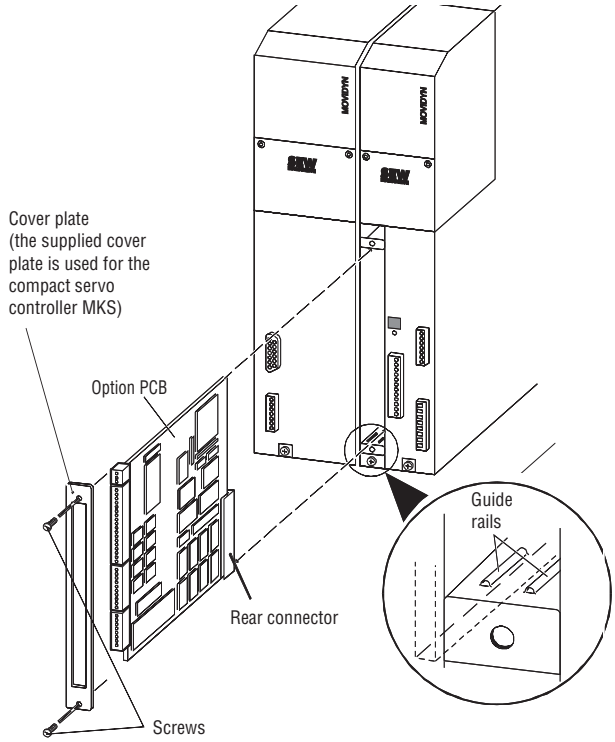
- Store the option pcbs in their original packaging and only take them out shortly before you fit them.
- Do not handle the pcbs unnecessarily and then only by the edges of the board. Do not touch any of the components on the pcbs.
- Please observe the sheet of instructions (addendum to the Operating Instructions) enclosed with the pcb .

Fitting the option pcb

- **Isolate the servo controller from the supply. Switch off the power supply and, if connected, the external 24 V supply.**
- **MAS:** Remove the left-hand black front cover plate: Withdraw the crosstip screws (2 screws).
  MKS: Remove the lower part of the protective cover plate.
  Important:
  When the controller cover is removed, the unit has enclosure IP00. Dangerous voltages may be present for up to 10 minutes after the unit has been disconnected from the supply.
- Take appropriate ESD measures before you touch the pcb (wrist strap, conductive shoes, etc.).Position the pcb with the backplane connector to the rear in the guide rails of the option pcb slot. Make sure that the pcb sits properly in the rear guide rails.
- Press the backplane connector of the pcb into the socket in the controller housing. The pcb sockets must be flush with the cover of the axis module / compact servo controller.
- **MAS**: Install the supplied cover plate to cover the option pcb slot and screw tight (2 screws).
  MKS: It is no longer possible to refit the plastic front cover depending on the option pcb. The supplied front cover must then be installed.

Commissioning the option pcb

- **Remove connector X21 to prevent the motor starting unexpectedly.**
- Connect the unit to the power supply or the external 24 V supply.
- Access the relevant menu items to establish whether the computer has “detected” the option pcb (check the operation of the option pcb if necessary).
- Program the terminals for the appropriate functions before you commission the drive.
- **Switch off the power supply and, if connected, the exteral 24 V supply.**
- Refit connector X21.



MD0054BEN

Fig. 4: Fitting the option pcb

7 Commissioning

Always observe the safety instructions in Section 3.

7.1 Preliminary Work

Before you proceed to program and parameterize the units you must first:

1. Connect the interface cable between the power supply module or compact servo controller and the PC (compact servo controller via the USS11A option).
   Important: Power supply module/compact servo controller and PC must be de-energized.
2. Check that the wiring is in accordance with the wiring diagram.
3. Set the axis address on the axis modules or the compact servo controllers. Each axis module must have its own unique axis address. (→ Sec. 7.1.1).
4. Install and start the MD_SHELL user interface (→ Sec. 7.1.2, 7.1.3).

7.1.1 Setting the axis addresss

On delivery and on activation of the factory setting (→ P610, Sec. 7.4.1) the unit address is “00". In multi-axis operation we recommend that the address “00” is not used. This prevents different axis modules having the same address after calling up the factory setting. The pushbutton S1 is used to set the address on the axis module. The possible addresses are 0 ... 59.

1. With an external 24 V power supply:
   – Switch on the external power supply. **Do not switch on the mains!**
   – The 7-segment display will show the operating condition “b” (not ready for operation).
   Without an external 24 V power supply:
   – Make sure that the terminal X 21.5 “Controller Inhibit” is active (“0” signal).
   – Switch on the mains supply.
   – The 7-segment display will show the operating condition “4” (controller inhibit activated).
2. Check the setting of the axis addresses:
   Press the pushbutton S1 briefly with a thin object.
   The 7-segment display changes and shows the current axis address:
   “A” (blinking) → tens position → units position (e.g. “A” → “ 1” → “9” = Axis module 19).
   The tens and units values for the axis address must be set separately.
   The instructions 3 to 6 must be carried out for each position.
3. Keep S1 pressed for more than 2 seconds.
   First of all the current axis address will be displayed.
   This is followed by, each blinking alternately for 2 seconds,
   – an “H” (= tens position, 0 ... 5)
   – and an “L” (0 units position, 0 ... 9)
   To set the tens position of the axis address, release S1 while “H” is blinking.
   To set the units position of the axis address, release S1 while “L” is blinking.
4. When S1 is released the current value appears.To increment the value, keep pressing S1, or tap it.
5. When the desired value is reached, release S1 / stop tapping it. The number will be registered and the address which is set will be displayed. When the symbol “≡” appears in the display, the new address has been stored.
6. The display changes again, and shows the operational condition.
7. Check that the address is correct, by pressing S1 briefly.

The following example demonstrates how the address of an axis module is changed from “00” to “11”.

Changing or setting the address of an axis module

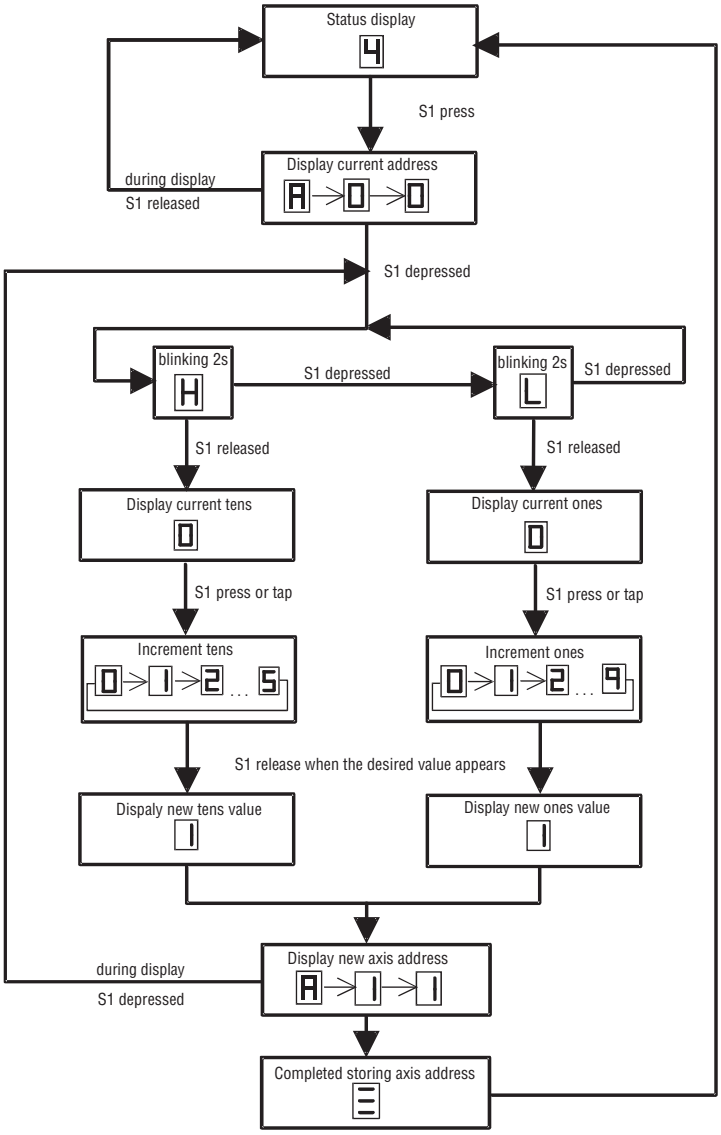


Fig. 5: Changing or setting the address of an axis module MD0034AEN

7.1.2 Setting up the user interface MD_SHELL (→ MD_SHELL)

1. Install MD_SHELL and start it.
2. Select the menu (Interface)
   - In the menu item “PC Interface” select the serial interface which connects the axis system to the PC (COM1, COM2)
   - In the “Controller interface” menu item select the serial interface which is to be used for serial communication in the axis system
     - RS-232 via USS, RS-485
     - RS-232 via MP/MPB
     - RS-232 via AIO
   - In the menu item “Controller Address” set the address of the axis module which is to be controlled by the PC.

7.1.3 Limit switch

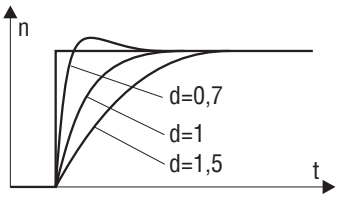
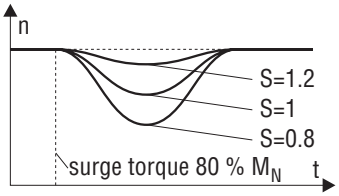
Important: As delivered, the terminals X 21.7 and X 21.8 are programmed as inputs for limit switches. If no limit switches are to be connected to the axis module, then the terminal programming must be altered (→ **MD_SHELL**) or both terminals must be connected to X 21.12 (+24 V), otherwise Fault 27 will occur (→ 8.3).

7.2 Setting the controller

- Basic setting of the speed controller

MD_SHELL makes it possible to perform a rapid commissioning. To achieve this, MD_SHELL calculates a basic setting for the speed controller from the specific data for the installation (→ MD_SHELL) .

1. Select the menu item “Commissioning” in the Parameter menu.
2. Enter all the data which are requested:

Menu Item	Remarks
“Motor size”	See the selection tables in Section 7.11. Only the motors listed there may be connected to the unit (nameplate)
“Motor rated votage“	Enter the correct rated voltage of the motor (nameplate).
“Rated speed”	Enter the correct rated speed for the motor (nameplate).
“Brake”	This entry is used for correct determination of the moment of inertia of the motor (nameplate).
“Damping of speed-control loop” 	The damping is a measure of the transient response of the speed control loop. The standard setting is 1.0 (aperiodic response). Range of values: 0.5 ... 2.0. Small values lead to a strong overshoot (increased tendency to oscillation). Large values cause a sluggish response (reduced tendency to oscillation).
“Stiffness of speed-control loop“ 	The stiffness is a measure of the speed of response of the speed control loop. The standard setting is 1.0. Range of values 0.5 ... 2.0. If the stiffness is increased the speed of response is higher; above a certain value the control loop will oscillate. If the stiffness is reduced the speed of response is slower and the lag error increases. Recommendation: when increasing the stiffness,, use small steps (e.g. 0.05).
“Time interval positioning control”	This corresponds to the cycle time of a higher-level positioning control and the resulting time-discrete setpoint changes.
“Drive”	Only enter “backlash-free” if the drive is genuinely free of backlash, otherwise it will cause uneven running!
“Moment of load motor shaft”	Enter the load moment of inertia reduced to the motor shaft, in the units shown.
“Shortest required ramp time”	The integrator ramps are set to the values displayed, as far as the acceleration capability of the drive permits. It makes sense to enter the next time value down from that produced by the higher- level positional control.
“Rated current axis module”	Shows the rated current.

3. Press [F2] to calculate the necessary parameters and set the limit values (→ Sec. 7.4.1). The program will calculate the basic setting for the speed controller which can then be used to start up the drive.
4. Transfer the calculated values to the servo controller by pressing the [F3] key.

As a rule, the basic setting will produce satsifactory results. However, the following aids are available if further optimization is required:

- Checking and optimizing the controller setting, displaying process data

Two possibilities are available for optimizing the basic setting of the controller parameters and displaying process data:

1. Use the utility program MD_SCOPE , which provides the functions of a digital storage oscilloscope. This program can be used to display the time characteristics of setpoints, actual values etc. on the screen, to store them and print them out, and to change the controller parameters.
2. If you do not have the MD_SCOPE utility available, you may use the AIO11 (→ Sec. 9.9) and an oscilloscope to optimize the controller parameters. To do this, you will have to program the analog outputs on the AIO 11 option pcb accordingly (→ Sec. 6.4, param. 340).

7.3 Programming the terminals

If you do not wish to use the default terminal assignment, you will have to reprogram the terminals (If you do not wish to use the default terminal assignment, you will have to reprogram the terminals (→ MD_SHELL; → Sec. 6.4, param. 300) to suit your requirements.

7.4 Setting the parameters

7.4.1 Parameter list, ranges, factory settings

- The MD_SHELL commissioning function will automatically determine the settings for the parameters marked with an asterisk (*), which can then be downloaded to the controller (→ Sec. 7.2).
- Options increase the number of available parameters and extend the functionality of the existing ones.
- A diagonal stroke "/" in front of the assignment indicates a function with active "0"...

No.	Designation	Setting range min. ..... step ..... max.	Factory setting(P610)
000 ...084	Process values for monitoring during operation		
100	Operating mode	SPEED CONTROL • TORQUE CONTROL • (with IPOS additionally : POSITIONING)	**SPEED CONTROL**
101	Factor for analog setpoint	0.10.....0.01 .....10.00	**1.00**
102	Offset for analog value 1 [mV]	-500.....1 500	**0**
103	Mode analog input 2	EX. CUR. LIMIT • W/O FUNCTION • RESERVED	**EXT. CUR. LIMIT**
110	Setpoint source	ANALOG INPUT • API/APA 12 OPT. PC INTERFACE • FIELDBUS	**ANALOG INPUT**
111	PC speed-setpoint [1/min]	-5000.00.....0.20 ..... +5000.00	**0.00**
120	Ramp 1 up CW [s] *	0.00.....0.02 .....0.50 0.50.....0.10 .....3.00 3.00.....0.50 .....10.00 10.00.....2 30	**1.00**
121	Ramp 1down CW [s] *		**1.00**
122	Ramp 1up CCW [s] *		**1.00**
123	Ramp 1 down CCW [s] *		**1.00**
130	Ramp 2 up CW [s] *		**1.00**
131	Ramp 2 down CW [s] *		**1.00**
132	Ramp 2 up CCW [s] *		**1.00**
133	Ramp 2 down CCW [s] *		**1.00**
140	Rapid-stop ramp [s]		**1.00**
150	Emergency stop ramp [s]	0.00.....0.02 .....0.50 0.50.....0.10 .....3.00 3.00.....0.50 .....10.00	**0.10**
200	Gain: speed controler *	0.10.....0.01 .....32.00	**2.00**

No.	Designation		Setting range min. ..... step ..... max.	Factory setting(P610)
201	Time constant: [ms] * speed controller		0..... 0.5.....0.5 0.5..... 0.10.....50.00 50.00..... 1.....300	**10.00**
202	D-portion: speed controller*		0.00..... 0.10.....32.00	**0.00**
203	Precontrol threshold [1/min/ms]		0..... 0.2.....3000	**3000**
204	Gain: feed forward *		0.00..... 0.01.....1.00 1.00..... 0.02.....80.00	**0.00**
205	Filter: feed forward [ms] *		0..... 1.....1	**0**
206	Filter: speed setpoint [ms] *		1..... 0.1.....100.00	**0**
207	Filter: speed actaul value [ms] *		0..... 1.....1 1..... 0.10.....32.00	**0**
208	7-segment test display		OFF • ON	**OFF**
209	Controller fest function		OFF • ON	**OFF**
210	Max. speed CW[1/min] *		0..... 1.....5000	**3000**
211	Max. speed CCW [1/min] *			**3000**
212	Max. current[% IN] *		45..... 1.....150	**100**
220	Gain: hold controller *		0.10..... 0.10.....32.00	**0.50**
300	Terminal X21.6		ENABLE • RAMP SELECTION •/CONTROLLER INHIBIT • HOLD CONTROL • /EXT. FAULT • RESET • /EXT. TRIGGER • NO FUNCTION · CW LIMIT SWITCH • CCW LIMIT SWITCH · (with IPOS additionally: REF. CAM • REFERENCE TRAVEL)	**ENABLE**
301	Terminal X21.7			**/CW LIMIT SW.**
302	Terminal X21.8			**/CCW LIMIT SW.**
310	Terminal X13.2	only with AIO11		**RESET**
311	Terminal X13.3			**RAMP CHANGEOVER**
312	Terminal X13.4			**NO FUNCTION**
313	Terminal X13.5			**NO FUNCTION**
314	Terminal X13.6			**NO FUNCTION**
315	Terminal X13.7			**NO FUNCTION**
316	Terminal X13.8			**EXT. TRIGGER**
320	Terminal X21.10		IxT-WARNING READY • FAULT • BRAKE • SPEED REFERENCE • CURRENT REF. • SET – ACTUAL VALUE COMPARISON • MOTOR STOPPED • NO FUNCTION (with IPOS additionally: POS. OUTPUT 1 ... 8 • IN POSITION • IPOS REFERENCE)	**READY**
330	Terminal X12.1	only with AIO11		**/FAULT**
331	Terminal X12.2			**IxT-WARNING**
332	Terminal X12.3			**IxT-WARNING**
333	Terminal X12.4			**IxT-WARNING**
334	Terminal X12.5			**IxT-WARNING**
335	Terminal X12.6			**IxT-WARNING**
340	Analog output 1 (X14.6)		CURRENT SETPOINT • ACTUAL SPEED • RAMP SETPOINT • ACTUAL RAMP VALUE • IxT UTILIZATION	**CURRENT SETPOINT**
341	Scaling factor 1		-5.00..... 0.10.....5.00	**1.00**
342	Analog output 2 (X14.7)		as P340	**ACTUAL SPEED**
343	Scaling factor 2		-5.00..... 0.10.....5.00	**1.00**
400	Reference speed [1/min]		0..... 1.....5000	**1500**
401	Hysteresis 1 [+/– 1/min]		0..... 1.....500	**100**
402	Delay [s]		0.00..... 0.10.....9.00	**1.00**
403	"1" signal on:		$n < n_{rel}$ · $n > n_{rel}$	**$n < n_{rel}$**
410	Reference current Iref [% IN]		0..... 1.....150	**100**
411	Hysterese 2 [+/– 1/min]		0.00..... 1.00.....10	**2.00**
412	Delay [s]		0.00..... 0.10.....9.00	**1.00**
413	"1" signal on:		$I < I_{rel}$ · $I > I_{rel}$	**$I < I_{rel}$**
420	Delay [s]		0.00..... 0.10.....9.00	**1.00**
421	"1" signal on:		$n <> n_{set}$ · $n = n_{set}$	**$n <> n_{set}$**
430	IxT reference value [% IN]		0..... 1.....100	**100**
500	Brake function		NO • YES	**NO**
501	Brake reaction time [ms]		0..... 1.....1000	**200**

No.	Designation	Setting range min. ..... step ..... max.	Factory setting(P610)
510	Speed monitoring	NO • YES	**YES**
511	Check interval n-monitoring [s]	0.00.....0.10 .....10.00	**1.00**
600	Monitor signal delay [s]	0.....1 9	**1**
610	Factory setting	NO • YES	**NO**
620	Fault response	RAPID STOP • EMERGENCY STOP RAMP	**RAPID STOP**
630	Auto-reset	NO • YES	**NO**
631	Time to restart [s]	3.....1 30	**3**
632	Manual reset	NO • YES	**NO**
633	Reaction to MP-reset	NONE • RESET	**NONE**
634	RESET-button axis module	ENABLED • DISABLED	**ENABLED**
640	Parameter lock	NO • YES	**NO**
650	Save to EEPROM	OFF • ON	**ON**
660	Response time [ms]	0.....5.0 200	**0.0**

8 Service information

8.1 Status indicators

8.1.1 Power supply module (LEDs)

LED		Interpretation
ON (green)	ON	Ready, no fault condition, DC-link voltage and internal 24 V electronics supply voltage within the permissible limits
	OFF	Not ready
24 V (green)	ON	24 V electronics supply (internal or external) is available
	OFF	No 24 V supply
TRIP (red)	ON	Fault condition (the fault is displayed on the axis module or in MD_SHELL)
	OFF	No fault

8.1.2 Axis module / compact servo controller (7-segment display)

Status	Display	Interpretation
Operating mode	1	Speed control, enabled
	2	Torque control, enabled
	3	Rapid stop is being carried out
	4	Controller inhibit activated (output stage inhibited)
	5	Reached CW limit switch
	6	Reached CCW limit switch
	7	API/APA 11 positioning control option board in operation
	8	Factory settings being implemented (display only with axis module which is "ready")
	9	Hold control activated
	b	Not ready
IPOS	A	IPOS in operation
	c	IPOS carries out reference travel
Fault	F	A fault is indicated by a flashing "F" followed by the two fault code figures. This fault indication will remain until the fault is reset (→ P63. and Sec. 7.3)

8.2 Reset options

- Power supply module
  - Switch mains off and on again.
  - Reset on any of the axis modules resets the power supply module.
    Note P 633!
- Axis module / compact servo controller
  - Switch mains off and on again.
    Or switch the external 24 V power supply off and on, if available.
  - Provide a reset command on the binary input terminal (→ P 30_).
  - Use auto-reset (→ P 630).
  - Reset via the serial interface (→ P 632).
  - Press S1 (→ P 634).

8.3 Diagnostics

Important:

All fault indications can be reset by a reset command. Faults which are detected in the power supply module (F03, F06, F07, F15) will be displayed by all the axis modules which are connected!
Other fault codes may occur when an option board is installed. (→ corresponding documentation)
In the event of a fault reset the incremental encoder simulation is reset, too.
In that case it is then necessary to check the encoder information.

The column „Response“ shows the reaction of the drive to the particular fault:

– **I =** **Instant disconnection**, i.e. the output stage is disabled (controller inhibit), and the brake is applied.
– **E =** **Emergency stop** (→ P 150)

Caution:
Because of the prevailing load conditions, motors **without mechanical brake** may continue to run in an uncontrolled manner (e.g. coast to rest).

Display		Fault		Response
Unit	**MD_SHELL**	**Cause**	**Remedy**	
F01	Overcurrent MAS... / MKS...	Overcurrent in output stage, caused by: - short-circuit in the motor or - defect in the output stage	Eliminate the short-circuit. If the fault persists and cannot be cleared, exchange the unit	**I**
F03	Overtemp. MPx...	Thermal overload of the power supply module / compact servo controller	Reduce power output and/or ensure that the cooling is adequate	**E**
F05	Signal bus conn.	Data bus cable not properly connected to X5	Check connections	**I**
F06	Earth fault	Earth fault in - power supply module or - axis module(s) or - motor(s)	Check the motor leads or check the motor for an earth fault	**I**
F07	DC-link	Excessive regenerative power, overvoltage in DC link	- Check leads to braking resistor - Check the braking resistor data (→ Sec. 9.4) - Increase deceleration ramp if necessary	**I**
F08	Speed monitoring	Speed control is at limit, because of - overload - loss of a phase of supply or of a motor phase - Resolver cable not correctly connected	- Lengthen the ramp / increase P511 - Check current limit - Check motor - Check motor leads - Check mains supply phases - Check the resolver cable	**I**
F09	S1 AI011 current	Slide switch S1 on the AIO 11 option card is in the wrong position	Set the slider switch S1 on AIO 11 to the “U” position	**I**
F11	Overtemp.MAS... / MKS...	Thermal overload of the axis module / compact servo controller	Reduce power output and/or ensure that the cooling is adequeat	**E**
F14	Resolver fault	- Resolver cable or screen is not correctly connected - Short-circuit or break in the resolver cable - Faulty resolver	Check the resolver cable and shield for: connection, short-circuit, cable breakage	**I**
F15	Internal 24 V MPx... / MKS..	No internal supply voltage in the power supply module / compact servo controller	Exchange the unit	**I**
F17… 24	Displays detailed fault information	System faults	Reset (→Sec. 8.2) If the fault cannot be cleared, call the SEW service Quote the fault code and the diagnostic information provided by MD_SHELL	**I**

Display		Fault		Response
Unit	**MD_SHELL**	**Cause**	**Remedy**	
F25	EEPROM	Error on accessing the EEPROM	Call up the factory setting (→ P610) Repeat commissioning.If the fault reoccurs: exchange the unit STOP	**I**
F26	External terminal	External fault signal read via programmable input	Eliminate the cause of the fault Reprogram the terminals if necessary	pro-grammable
F27	ES open circuit	Broken wire or both limit switches missing	Check the wiring and the limit switchesReprogram the terminals if neccesary	**E**
F28	Fieldbus Timeout	Communication error while transmitting process data	Check fieldbus connection, see corresponding manual	pro-grammable
F29	Limit switches reversed	Limit switches are reversed with respect to the direction of rotation of the motor	Exchange the limit switches connections on X21.7 and X21.8	**E**
F31	Output short-circuit	Short-circuit or overload on one or more of the binary outputs	Check the wiring and the connected elements.Limit the current to 50 mA necessary	**I**
F32	Setpoint source not defined	The setpoint source is not defined	Select the correct setpoint source with P110	**I**
F34	Fieldbus Timeout	Communication error while transmitting communication data	Check fieldbus connection, see corresponding manual	pro-grammable
F36	Missing hardware	An attempt was made to access a non-existent option board	- Insert the correct option board or - Select the correct setpoint source with P110	**I**
F39, 41, 42, 58, 72, 76-78		Fault from IPOS positioning control	see IPOS Manual	**E**
F40-42,50-74		Fault from positioning control	see APA/API Manual	**E**
F43	Timeout PC-control	Communication monitoring between the PC and the axis modules is active. Monitoring time exceeded.	Increase the PC timeout value in the “Panel” menu item in the [Parameter] menu, or deactivate by entering a “0"	**I**
F87	Fieldbus Timeout	Communication fault in fieldbus mode	Check fieldbus connection, see corresponding manual	pro-grammable
	Displays undefined signals	System fault	Reset (→ sec. 8.2) If reoccuring, replace unit.	**I**

8.4 SEW Electronics Service

If a fault cannot be remedied, then please contact the **SEW Electronics Service** (→"After-Sales Service and Spare Parts" addresses).

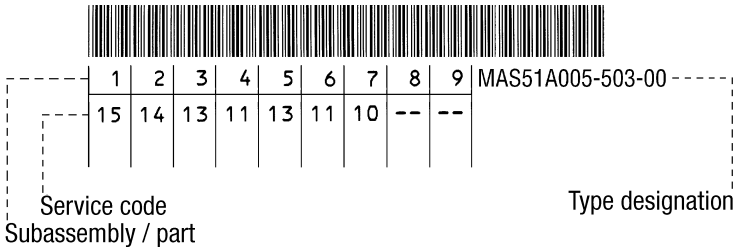


Fig. 6: Service label

00276AEN

When contacting the SEW Electronics Service, please always quote the service code data from the service label that we may better serve you.

If you return equipment for testing or repair, please:

- describe the nature of the fault
- explain when and under what background conditions the fault occurred
- state the suspected cause
- state any abnormal circumstances, etc. that may have preceded the fault

9 Technical Data

Storage

Permissible storage temperature: – 25 °C ... + 70 °C
Permissible humidity: No restrictions during storage.
Unit must be free of condensation before commissioning.
For extended storage: Connect the unit to the supply for at least 5 minutes every 2 years.
Failing that, the service life of the unit may be reduced.

Installation altitude

0 ... 1000 m (3300 ft) without power reduction
1000 ... 2000 m (6600 ft) power reduction 1 % per 100 m (330 ft)

9.1 MPB… / MPR… power supply modules with brake chopper

Type		MPB 51A 011-503-00	MPB 51A 027-503-00	MPB 51A 055-503-00	MPR 51A 015-503-00	MPR 51A 037-503-00
Part number		826 074 5	826 075 3	826 076 1	825 865 1	825866 X
Mains						
Rated voltage	$U_{mains\ N}$	380 V_{AC} – 10 % ... 500 V_{AC} + 10 % for UL: 380 V_{AC} – 10 % ... 480 V_{AC} + 10 %			380 V_{AC} – 10 % ... 500 V_{AC} + 10 %	
Frequency	$f_{mains\ N}$	50 Hz / 60 Hz ± 5 %			50 Hz / 60 Hz ± 5 %	
Rated current	$I_{mains\ N}$	16 A_{AC}	40 A_{AC}	80 A_{AC}	21 A_{AC}	53 A_{AC}
DC link (V_{mains} = 400 V)						
No-load voltage	$U_{DC\ link}$	560 V_{DC} ($\sqrt{2}$ x U_{mains})				
Rated current Peak current [1]	$I_{DC\ link\ N}$ $I_{DC\ link\ max}$	20 A_{rms} 40 A_{rms}	50 A_{rms} 100 A_{rms}	100 A_{rms} 200 A_{rms}	27 A_{rms} 40 A_{rms}	67 A_{rms} 100 A_{rms}
Power rating	$P_{DC\ link\ N}$	11 kW	27 kW	55 kW	15 kW	37 kW
Peak power [1]	$P_{DC\ link\ max}$	22 kW	54 kW	110 kW	22 kW	55 kW
Braking resistor (external)	R (±10 %)	47 Ω	18 Ω	15 Ω	-	
Peak braking power	P_{BRCmax}	14 kW	38 kW	45 kW		
Switch-mode power supply		250 W, dimensioned for the connection of max. 6 axis modules			when supplied with external 24 V_{DC} for the connection of 6 axis modules max. without external 24 V_{DC} to drive either 2 axis modules without an option or 1 axis module and 1 option	
Enclosure		IP20 (EN 60529)				
Duty type		DB (DIN 57558 Teil 1)				
Type of cooling		forced cooling – KF (DIN 41751)			natural convection (DIN 41751)	
Ambient temperature	ϑ_{amb}	0 °C ... 45 °C without power derating 45 °C ... max. 60 °C power derating: 3 % per K				
Weight	m_{MP}	5.5 kg (12.1 lb)	7 kg (15.4 lb)	7 kg (15.4 lb)	5.5 kg (12.1 lb)	7 kg (15.4 lb)
Dimension						
Housing W × H × D	[mm] [in]	105×380×250 4.13×14.96×9.84	140×380×250 5.51×14.96×9.84		105×380×250 4.13×14.96×9.84	140×380×250 5.51×14.96×9.84
Width in grid-pitch units (1 unit = 35 mm = 1.38 in)	BTE	3	4		3	4
Line choke type	→ Sec. 9.6	ND020-013	ND045-013	ND085-013	ND045-013	ND085-013
Braking resistor type	→ Sec. 9.4	BW x47	BW018-...	BW x15	not required	
Mains filter type (V_{mains} ≤ 400 V)	→ Sec. 9.7	NF025-443	NF050-443	NF080-443	NF036-443	NF080-443
Mains filter type (V_{mains} ≤ 400 V)	→ Sec. 9.7	NF025-503	NF050-503	NF080-503	NF036-503	NF080-503

1) MPB power supply modules may be operated with peak current / peak power for max. 5 s.

9.2 MAS… axis modules

Type		MAS 51A 005-503-00	MAS 51A 010-503-00	MAS 51A 015-503-00	MAS 51A 030-503-00	MAS 51A 060-503-00
Part number		826 069 9	826 070 2	826 071 0	826 072 9	826 073 7
Input voltage = DC link voltage	$V_{DC\ link}$	U_Z = 700 V_{DC} / U_{Zmax} = 900 V_{DC}				
Output voltage	V_N	0 ... U_{mains}				
Rated output current	I_N	5 A_{AC}	10 A_{AC}	15 A_{AC}	30 A_{AC}	60 A_{AC}
Peak output current (with matched heat sink) max. 0.3 s for n ≤ 30 1/min; continuous for n > 30 1/min	I_{max}	7.5 A_{AC}	15 A_{AC}	22.5 A_{AC}	45 A_{AC}	90 A_{AC}
Enclosure		IP20 (EN 60529)				
Duty type		DB (DIN 57558 Part 1)				
Type of cooling		natural convection – KS (DIN 41751)				
Ambient temperature	ϑ_{amb}	0 °C ... 45 °C without power derating45 °C ... max. 60 °C power derating 3 % per K				
Weight	m_{MA}	3.5 kg (7.7 lb)			5.5 kg (12.1 lb)	7 kg (15.4 lb)
Dimensions						
Housing B× H× T	**[mm]**	70×380×250			105×380×250	140×380×250
	[in]	2.75×14.96×9.84			4.13×14.96×9.84	5.51×14.96×9.84
Width in grid-pitch unit (1 unit = 35 mm = 1.38 in)	B_{TE}	2			3	4

9.3 MKS… servo controller

Type		MKS 51A-005-503-00	MKS 51A-010-503-00	MKS 51A-015-503-00
Part number		826 044 3	826 045 1	826 429 5
Mains				
Rate voltage	V_{mains}	380 V_{AC} – 10 % ... 500 V_{AC} + 10 % for UL: 380 V_{AC} – 10 % ... 500 V_{AC} + 10 %		380 V_{AC} – 10 % ... 500 V_{AC} + 10 %
Frequency	f_{mains}	50 Hz / 60 Hz ± 5 %		
Current	I_{mains}	4.5 A_{AC}	9 A_{AC}	13.5 A_{AC}
Output				
Rated output current	I_N	5 A	10 A	15 A
Pead output current max. 0.3 s for n ≤ 30 1/min; continuous for n > 30 1/min	I_{max}	7.5 A	15 A	22.5 A
Output voltage	V_{outp}	0 ...V_{mains}		
Braking resistor (external)	**R (±10%)**	47 Ω		
Peak braking power	P_{BRCmax}	5 kW	10 kW	14 kW
Enclosure		IP20 (EN 60529)		
Duty type		DB (DIN 57558 Teil 1)		
Type of cooling		forced cooling – KF (DIN 41751)		
Ambient temperature	ϑ_{amb}	0 °C ... 45 °C without power derating 45 °C ... max. 60 °C power derating 3 % per K		
Weight	m_{MP}	4.5 kg (9.9 lb)		6.5 kg (14.3 lb)
Dimensions				
Housing W × H × D	**[mm]**	105×275×275		130×336×325
	[in]	4.13×10.83×10.83		5.12×13.23×12.80
Mounting a1 × b1 dimensions [mm] (vertical × horizontal) Hole size: 6.5 mm (0.26 in)	**[mm]**	290×70		300×105
	[in]	11.42×2.76		11.81×4.13
Line choke type	→ Sec. 9.6	Not required		
Braking resistor type	→ Sec. 9.4	BW047-004 / BW 147 / BW 247 / BW 347 / BW047-005		
Mains filter type V_{mains} ≤ 400 V)	→ Sec. 9.7	NF008-443		NF025-443
Mains filter type (V_{mains} ≤ 500 V)	→ Sec. 9.7	NF008-503		NF025-503

9.4 Braking resistor

- Enclosure: IP 20 when mounted
- ambient operating temperature ϑ_{amb} : -20... +45 °C
- Type of cooling: natural convection (KS)

Servo controller type		MPB 51A 011-503-00				
Braking resistor type		**BW047-004**	**BW147**	**BW247**	**BW347**	**BW547**
Part number		822 080 8	820 713 5	820 714 3	820 798 4	820 053 5
Load capacity	P_N	0.4 kW	1.2 kW	2 kW	4 kW	6 kW
Resistor rating at	**100 % cdf**	0.4 kW	1.2 kW	2 kW	4 kW	6 kW
	50 % cdf	0.7 kW	2.2 kW	3.8 kW	7.6 kW	10.8 kW
	25 % cdf	1.2 kW	3.8 kW	6.4 kW	12.8 kW	18 kW*
	12 % cdf	2.4 kW	7.2 kW	12 kW	24 kW*	30 kW*
	6 % cdf	3.8 kW	11.4 kW	19 kW*	38 kW*	45 kW*
Resistance value	**R**	47 Ω ± 10 %				
Tripping current	I_{trip}	1.5 A	3.8 A	5.3 A	8.2 A	10 A
Design		Wire resistor on ceramic tube				Steel-grid resistor
Electrical connections		Ceramic terminals for 2.5 mm² (AWG#14)				M8 stud bolt
Weight	m_{BW}	1.9 kg (4.2 lb)	4.3 kg (9.5 lb)	6.1 kg (13.4 lb)	13.2 kg (29.0 lb)	12 kg (26.4 lb)

Servo controller type		MPB 51A 027-503-00			MPB 51A 055-503-00	
Braking resistor type		**BW018-015**	**BW018-035**	**BW018-075**	**BW015-015**	**BW715**
Part number		821 684 3	821 685 1	821 686 X	822 081 6	821 258 9
Load capacity	P_N	1.5 kW	3.5 kW	7.5 kW	1.5 kW	3 kW
Resistor rating at	**100 % ED**	1.5 kW	3.5 kW	7.5 kW	1.5 kW	3 kW
	50 % ED	2.8 kW	6.3 kW	13.5 kW	2.8 kW	5.4 kW
	25 % ED	4.8 kW	10.5 kW	22.5 kW	4.8 kW	9 kW
	12 % ED	9 kW	17.5 kW	37.5 kW	9 kW	15 kW
	6 % ED	14 kW	26.6 kW	57 kW*	14 kW	22 kW
Resistance value	**R**	18 Ω ± 10 %			15 Ω ± 10 %	
Tripping current	I_{trip}	5.8 A	8 A	15 A	5.5 A	8 A
Design		Laminated resistor	Steel-grid resistor		Laminated resistor	Steel-grid resistor
Electrical connections		Ceramic terminals for 2.5 mm² (AWG#14)				M8 stud bolt
Weight	m_{BW}	4 kg (8.8 lb)	9 kg (19.8 lb)	21 kg (46.3 lb)	4 kg (8.8 lb)	8.5 kg (18.7 lb)

Servo controller type		MPB 51A 055-503-00		MKS 51A xxx-503-00				
Braking resistor type		**BW815**	**BW915**	**BW047-005[1)]**	**BW047-004**	**BW147**	**BW247**	**BW347**
Part number		821 259 7	821 260 0	826 268 3	822 080 8	820 713 5	820 714 3	820 798 4
Load capacity	P_N	6 kW	16 kW	0.45 kW[2)]	0.4 kW	1.2 kW	2 kW	4 kW
Resistor rating at	**100 % ED**	6 kW	16 kW	0.45 kW	0.4 kW	1.2 kW	2 kW	4 kW
	50 % ED	10.8 kW	28.8 kW	0.60 kW	0.7 kW	2.2 kW	3.8 kW	7.6 kW
	25 % ED	18 kW	48 kW*	0.33 kW	1.2 kW	3.8 kW	6.4 kW	12.8 kW
	12 % ED	30 kW	80 kW*	1.1 kW	2.4 kW	7.2 kW	12 kW	24 kW*
	6 % ED	45 kW	120 kW*	2.0 kW	3.8 kW	11.4 kW	19 kW*	38 kW*
Resistance value	**R**	15 Ω ± 10 %		47 Ω ± 10 %				
Tripping current	I_{trip}	12 A	29 A	1.1 A	1.5 A	3.8 A	5.3 A	8.2 A
Design		Steel-grid resistor		Flat-pack	Laminated resistor			
Electrical connections		M8 stud bolt		Wire	Ceramic terminals for 2.5 mm² (AWG#14)			
Weight	m_{BW}	14 kg (30.9 lb)	26 kg (57.3 lb)	0.6 kg (1.3 lb)	1.9 kg (4.2 lb)	4.3 kg (9.5 lb)	6.1 kg (13.4 lb)	13.2 kg (29.1 lb)

1) Enclosure IP 54 (NEMA 4), temperature touch guard, part number 813 152 X, DIN rail mounting for touch guard, part number 822 194 4.
2) The rating applies to horizontal mounting. If mounted vertically, these values reduce by 10 %.

** limitations of regenerative power*

9.5 Heat sinks

- DKF – forced convection
- DKS – natural convection
- DKE – natural convection

Type		DKF 05	DKF 07	DKF 09	DKS 05	DKS 07	DKS 09	DKE 05	DKE 07
Part number		821 666 5	821 667 3	821 668 1	821 740 8	821 741 6	821 742 4	821 819 6	821 820 X
Thermal resistance	R_{th}	0.09 K/W	0.06 K/W	0.055 K/W	0.27 K/W	0.21 K/W	0.17 K/W	0.6 K/W	0.4 K/W
Supply voltage		24 V_{DC}			–				
Power consumption		6 W	9 W		–				
Weight	m_{DK}	6.3 kg (13.9 lb)	8.8 kg (19.4 lb)	10.5 kg (23.2 lb)	6 kg (13.2 lb)	8.4 kg (18.6 lb)	10 kg (22.0 lb)	1.8 kg (4.0 lb)	3 kg (6.6 lb)
Dimensions									
housing dim. W × H × D	[mm]	175×423×90	245×423×90	315×423×90	175×423×90	245×423×90	315×423×90	175×418×25	245×418×25
	[in]	6.89×16.65×3.54	9.64×16.65×3.54	12.4×16.65×3.54	6.89×16.65×3.54	9.64×16.65×3.54	12.4×16.65×3.54	6.89×16.46×0.98	9.64×16.46×0.98
Width in grid-pitch units (1 unit = 35 mm = 1.38 in)	B_{TE}	5	7	9	5	7	9	5	7

9.6 Line chokes

Line chokes type		ND 020-013	ND 045-013	ND 085-013
Part number		826 012 5	856 013 3	826 014 1
Rated current	I_N	20 A_{AC}	45 A_{AC}	85 A_{AC}
Inductance	L_N	0.1 mH		0.13 mH
Rated voltage	U_N	3 × 380 V_{AC} ... (max. operating voltage 550 V_{AC})		
Mains frequency	f_{mains}	50 / 60 Hz		
Ambient temperature	ϑ_{amb}	– 25 ... + 45 °C		
Enclosure class		IP 00 (EN 60 529)		
Weight	m_{ND}	0.5 kg (1.1 lb)	2.5 kg (5.5 lb)	6.5 kg (14.3 lb)
Used with:		MPB 51A 011-503-00 MKS 51A xxx-503-00	MPB 51A 027-503-00 MPR 51A 015-503-00	MPB 51A 055-503-00 MPR 51A 037-503-00

9.7 Mains filter

Mains filter type		NF 008-443	NF 025-443	NF 036-443	NF 050-443	NF 080-443
Part number		825 721 3	825 718 3	825 717 5	825 716 7	825 830 9
Mains filter type		NF 008-503	NF 025-503	NF 036-503	NF 050-503	NF 080-503
Part number		825 831 7	825 833 3	825 834 1	815 835 X	826 077 X
Rated current	I_N	8 A_{AC}	25 A_{AC}	36 A_{AC}	50 A_{AC}	80 A_{AC}
Rated voltage	V_N for NF…-443	3 × 400 V (max. operating = 440 V_{AC})				
Rated voltage	V_N for NF…-503	3 × 500 V (max. operating = 550 V_{AC})				
Mains frequency f_{mains}		50/60 Hz				
Dimensions W × H × D	[mm]	221×115×60,5	251×150×68,5	251×150×68,5	251×150×68,5	428×171×91
	[in]	8.70×4.53×2.38	9.88×5.91×2.70	9.88×5.91×2.70	9.88×5.91×2.70	16.85×6.73×3.58
Mounting dimension a × b	[mm]	115×100	115×135	115×135	115×135	375×130
	[in]	4.53×3.94	4.53×5.31	4.53×5.31	4.53×5.31	14.76×5.12
Connecting terminals - cross section		4 mm^2 (AWG#12)	10 mm^2 (AWG#8)			25 mm^2 (AWG#4)
Used with:		MKS51A 005-503-00 MKS51A 010-503-00	MPB51A 011-503-00 MKS51A 015-503-00	MPR51A 015-503-00	MPB51A 027-503-00	MPB51A 055-503-00 MPR51A 037-503-00

9.8 Output choke

- Pass the motor cable through the output choke in 3 - 5 turns. Where large cable diameters are used, the motor cable may be passed through the output choke in less than 5 turns and 2 or 3 output chokes connected in series instead..

Output choke		HD 001	HD 002	HD 003
Part number		813 325 5	813 557 6	813 558 4
Dimensions W × H × D	[mm]	121×64×131	66×49×73	170×64×185
	[in]	4.76×2.52×5.16	2.60×1.93×2.87	6.69×2.52×7.28
Weight		0.5 kg (1.1 lb)	0.2 kg (0.4 lb)	1.1 kg (2.4 lb)
For use with		all MAS... / MKS... units		

9.9 "Input-Output functions", option AIO 11

(part number 821 731 9)

- This board expands the possibilities of the axis module for control and monitoring, by providing additional freely programmable inputs and outputs:
- Features:
  – 1 RS-232 serial interface
  – 6 binary outputs (choice of 9 (+10 with IPOS) signals)
  – 7 binary inputs (choice of 10 (+2 with IPOS) functions)
  – 1 analog input
  – 2 analog outputs (choice of 5 functions)

- **Important:** If the analog differential input X14.3 / X14.4 is not used for the external current limit, then terminal X14.3 must be connected to X14.1 (+10 V) or P103 must be set to NO FUNCTION.

- AIO 11 is also required for optimizing the controller parameters of the MOVIDYN® Servo Controller with convential measuring equipment (storage oscilloscope).

Terminal assignment

Function	Connector	Terminal	Data
Serial interface [1]	X11		RS-232 serial interface
Binary outputs	X12		Selection from 9 monitoring functions: Ixt warning • Ready • Fault • Brake • Speed reference • Current reference • Setpoint / actual value comparison • Motor stopped • (with IPOS additionally: In Position • Pos. output 1...8 • IPOS reference)
Terminals 1 - 6 are freely programmable		1, 2, 3, 4, 5, 6	Terminals 1 - 6:"1" = +24 VDC , max. 50 mA
		7	0V24 = ref. potential for binary inputs and outputs
Auxiliary supply output	X13	1	+ 24 V_{DC}, max. 200 mA[2]
Binary inputs			Selection from 10 functions: Enable • Ramp changeover • Controller inhibit • Hold control • External fault • Reset • Go to reference mark • External trigger • No function • (with IPOS additionally: Reference travel • Reference cam)
Terminals 2 - 8 are freely programmable		2, 3, 4, 5, 6, 7, 8	Terminals 2 - 8 (DIN 19240): "1" = + 13 V_{DC} ... + 30 V_{DC} typically: 24 V (6 mA) "0" =- 3 V_{DC} ... + 5 V_{DC}
Supply voltage, e.g. for setpoints	X14	1	+10 V — max. 3 mA
		2	–10 V
Analog differential input for external current limit		3	V_{A2} Setpoint 2+ — –10 V_{DC} ... +10 V_{DC}
		4	V_{A2} Setpoint 2– — $R_i \geq 20\ k\Omega$
		5	0V15 = analog reference potential
Analog outputs			Selection from 5 variables: Current setpoint • Actual speed • Ramp setpoint • Actual ramp value • Ixt utilization
Terminals 6 and 7 are freely programmable		6, 7	Analog output 1 — ±10 V max. 3 mA
			Analog output 2 — ±10 V resolution: 8 Bit incl. +/- character

1) This serial interface works independently of the RS-232 serial interface of the power supply module and the RS-232 serial interface of the AIO 11 "input/output" option boards of additional axis modules/compact servo controllers, thus permitting simultaneous use of several interfaces. When a parameter of an axis module/compact servo controller is accessed through more than one interface at the time, the parameter values last received will be accepted.

2) MKS: If there is no external 24 V supply, the load on X21:12 (MKS) and X13:1 (AIO11A) together must not exceed 200 mA.

9.10 APA12/API12 "Single-axis positioning control" option

(API 12: Part number 822 369 6)
(APA 12: Part number 822 371 8)

- Extends the MOVIDYN® system with a precision single-axis positioning control, to relieve the higher-level controller from the work of positioning. Installation and commissioning: → "Single-axis positioning control APA 12/API 12 – User's Manual" (No. 09220615).
- Features:
  - 16 binary inputs – 8 with fixed assignment, 8 freely programmable
  - 8 output terminals, freely programmable
  - 1 CAN-bus interface for future expansion
  - Encoder simulation of the axis module or, alternatively, external incremental encoder with 5 V TTL level (RS-422) can be connected.
  - Absolute value encoder connection
  - Power supply for external encoders

Terminals assignments for API 12 / APA 12

Function	Conn.	Terminal	Data	
CAN-bus	X11	1, 2, 3	not used	
Binary inputs				to DIN 19240
fixed		4	automatic/manuel	
fixed		5	start prog. /go to ref. mark	
fixed		6	feed enable	"1" =
fixed		7	entry enable	+ 13 V_{DC} ... + 30 V_{DC}
fixed		8	reference cam	typically 24 V_{DC} (6 mA)
fixed		9	jog mode +	
fixed		10	jog mode -	
fixed		11	touch probe	
freely programmable		12	–	"0" =
freely programmable		15 ... 21	–	"0" = – 3 V_{DC} ... + 5 V_{DC}
24 V supply output				
to supply the binary		13	0V24 = ref. potential for 24 V	load capacity
inputs and outputs		14	+ 24 V_{DC}	max. 200 mA[1)]
Binary outputs				DIN 19240
freely programmable		22	end program	
freely programmable		23	axis in position	
freely programmable		24	go to ref. mark defined	"1" = + 24 V_{DC}
freely programmable		25	touch probe active	max. 500 mA
freely programmable		26	break point logic active	per output
freely programmable		27	fault signal	(ohmic load)
freely programmable		28	–	
freely programmable		29	–	
24 V supply output to supply the binary outputs		30	0V24 (A) = ref. potential for 24 V	
		31	+ 24 V_{DC} (A)	
Encoder input		32, 33	API12: A, A; APA12: Clock+, Clock-	RS-422 - level
		34, 35	API12: B, B; APA12: Data+, Data-	1024 pulses/revolution
		36, 37	API12: C, C; APA12: unassigned	
Power supply output for external encoder		38	0V15 = ref. potential for 15 V	load capacity
		39	+ 15 V_{DC} stabilized	max. 240 mA

1) MKS: If there is no external 24 V supply, the load on X21:12 (MKS) and X13:1 (APA12/API12) together must not exceed 200 mA.

9.11 USS 11A "RS-232 serial interface"

(Part number 821 595 2)

The MPR... power supply modules and the MKS... compact servo controllers can be extended with an electrically isolated RS-232 serial interface. It is implemented as an enclosed plug-in unit with a 9-pin D-type socket (EIA standard), which connects to the controller housing. It can be plugged into the dedicated X01 (MPR...) / X2 (MKS...) connector while the inverter is running.

Commissioning, operation and service can be carried out from the PC via the serial interface, using the SEW MD_SHELL software. This option further allows the user to transfer set parameters to several inverters from the PC at the same time.

To connect a PC to a FIS 31 a standard serial interface cable (screened, max. length = 5 m (16.4 ft)) with a 9-pin D-type plug is used.

Pin assignment of the interface cable, PC side

9-pin cable assignment Cable side:	**RXD** Receive data	**TXD** Transmit data	**DTR** Data terminal ready (transmit/receive changeover)	**Ground**
9-pin connector (MOVIDYN® side)	PIN 2	PIN 3	PIN 4	PIN 5
9-pin socket (PC-COMx side)	PIN 2	PIN 3	PIN 4	PIN 5

When using a 9 to 25-pin adapter:

9/25-pin cable assignment Cable side:	**RXD** Receive data	**TXD** Transmit data	**DTR** Data terminal ready (transmit/receive changeover)	**Ground**
9-pin connector (MOVIDYN® side)	PIN 2	PIN 3	PIN 4	PIN 5
25-pin socket (PC-COMx side)	PIN 3	PIN 2	PIN 20	PIN 7

When using PLC communications modules, refer to the corresponding documentation for the connector pin assignment.

Dimensions of the USS11A: W x H x D = 85 x 120 x 28.5 mm (3.34 x 4.72 x 1.12 in)

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